



Supplemental Expert Report

**Scott A. Stout, Ph.D., P.G.
Allen D. Uhler, Ph.D.
Katherine L. Flanders, Ph.D.**

**NewFields Environmental Forensics Practice, LLC
300 Ledgewood Place, Suite 305
Rockland, Massachusetts 02370**

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Prepared at the Direction of

**K&L Gates LLP
K&L Gates Center, 210 Sixth Avenue
Pittsburgh, PA 15222**

In the Matter of

Wheeler et al. v. Arkema Inc.

***U.S. District Court, Southern District of Texas, Houston Division
Civil Action No. 4:17-cv-2960***



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Section 1: Introduction and Executive Summary

This report supplements our original 2018 report¹, which provided our opinions regarding the original 2018 report of plaintiffs' expert, Dr. Marco Kaltofen. In connection with this supplemental report, we re-analyzed the available chemical data considering the "new" background datasets Dr. Kaltofen cites in his supplemental 2021 report. **We find the new background datasets provide no evidence of Arkema-derived contamination in the proposed Class Area.** This reaffirms the opinions presented in our original 2018 report:

- The plaintiffs' experts reported isolated and discrete visual observations of macroscopic ash and "black goo"² within the proposed Class Area, but the available chemical data indicate that microscopic particles of ash or "black goo" are not widespread, not uniformly distributed, or not even present within the proposed Class Area.
- Specifically, the available data indicate that PCDD/Fs (hereinafter referred to collectively for convenience as "dioxins"), PAHs, "custom-SVOCs," or metals³ measured in environmental media at class members' properties could not have arisen solely, and in nearly all cases, even in part, from discharges or emissions of ash or ash-like particles or "black goo" from the Arkema events.
- The spatial distribution and "chemical fingerprints" of the chemicals measured by the plaintiffs' experts in soil samples from properties within the proposed Class Area are not the result of a single point source such as the Arkema events. In almost all cases, they are consistent with anthropogenic background conditions,⁴ indicating that they result from a variety of household, local, and regional sources.
- Dr. Kaltofen's assertions that the Arkema events were the sole or principal source of the detected chemicals is scientifically indefensible because it ignored or downplayed that: (1) the detected chemicals are ubiquitous in the modern environment, including in residential settings, (2) the detected chemicals were present only at low background-level concentrations within the proposed Class Area, and (3) there are many known alternative sources in the Crosby area.
- Dr. Kaltofen consistently made scientifically inappropriate and misleading "apples-to-oranges" comparisons between the presence of alleged Arkema-derived chemicals in a few *ad hoc* solid samples (e.g., ash, "black goo," soot from a doorframe, vacuum cleaner dust, drywall) with the concentrations of these chemicals in a single background soil sample collected outside the 7-mile radius of the proposed Class Area. In contrast, our

¹ Stout, S.A., Uhler, A.D., and Flanders, K.L. (2018) Expert Report, Wheeler et al. v. Arkema Inc., U.S. District Court, Southern District of Texas, Houston Division, Civil Action No. 4:17-cv-2960. Dated Oct. 5, 2018, 93 p. plus five Exhibits. We simply refer to this report as Stout, S.A. et al. (2018) in the remainder of this report.

² Glass, M. (2018), p. 14-15. "Black goo" is a term used by Mr. Glass, which he describes as being derived from "*settling of airborne Arkema contaminants and particulates*" that "*coalesced on the soil and gravel surface as a residual, plastic or tar-like material.*" We don't agree with his characterization of this material but adopt it for convenience to respond to Mr. Glass's and Dr. Kaltofen's contentions.

³ These four chemical groups were the focus of the plaintiffs' experts' allegations of the Arkema events' impacts. (1) PCDD/Fs refers to polychlorinated dibenzo-p-dioxins and furans; (2) PAHs refers to polycyclic aromatic hydrocarbons; (3) custom-SVOCs refers to six semi-volatile organic compounds Dr. Kaltofen considered to be "markers" for the Arkema events, and (4) metals (Al, Ba, Ca, and Zn) also alleged by plaintiffs to be "markers" for the Arkema events.

⁴ Stout, S.A. et al. (2018), p. 1.



evaluations of the data relied upon scientifically appropriate, “apples-to-apples” comparisons between the ~120 surface soil samples collected in the proposed Class Area and large published datasets on these chemicals’ background concentrations in urban and rural soils.

- Dr. Kaltofen improperly equated “detection” of a chemical with an “impact” by the Arkema events. His minimal attempts to demonstrate the Arkema events were the source of these chemicals were, in every case, scientifically unsound and inconsistent with generally accepted site assessment practices.
- In summary, Dr. Kaltofen’s premise that there was a causal link between the Arkema events and impacts to all properties within the proposed Class Area is contradicted by the available data.

In his supplemental 2021 report, Dr. Kaltofen discusses four topics: (1) background concentrations of some chemical compounds, (2) potential confounding sources of chemical releases, (3) persistence of alleged Arkema-related chemicals in the environment, and (4) resuspension and tracking of pollutant into homes. Specifically, in his supplemental report, Dr. Kaltofen:

- Introduces a few “new” published background soil datasets focused on soils from Texas that he alleges provide evidence of widespread impacts (above background) from the Arkema events. However, he continues to make scientifically inappropriate “apples-to-oranges” comparisons between concentrations in these “new” Texas background soil datasets *versus* those in a few *ad hoc* solid samples (e.g., ash, “black goo,” soot, vacuum cleaner dust, drywall) from discrete locations within the proposed Class Area.
- Attempts to rule out two alternative sources of PAHs, but continues to completely ignore other household, local, and regional alternative sources we identified in our original report without explanation and does not address alternative sources of other chemicals, such as dioxins, alleged to have been emitted during the Arkema events. In particular, he ignored the impacts of backyard burning of residential trash and yard waste in burn barrels and burn piles, which are recognized as the largest source of dioxins in the U.S.⁵ This is believed to be a common practice in the vicinity of the Arkema facility, because an Arkema consultant observed 10 such backyard burning events within the proposed Class Area during only a 5-day period in September 2017 and at least one of the former class representatives acknowledged the practice.⁶
- Asserts generally that dioxins and PAHs are persistent chemicals in the environment, such that they are able to move around the proposed Class Area through natural mechanisms.
- Asserts generally that environmental contaminants can be tracked into homes.

⁵ EPA (2006) An inventory of sources and environmental releases of dioxin-like compounds in the U.S. for the Years 1987, 1995, and 2000. Final report. National Center for Environmental Assessment, Washington, DC; EPA/600/P-03/002F.

⁶ Deposition of Greg Nason, August 17, 2018, at p. 228, lines 15-22.

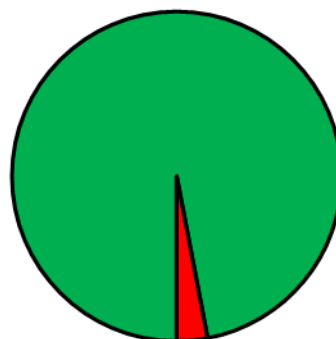


Dr. Kaltofen's supplemental report either fails to correct the deficiencies in his original assessment or further substantiates the points we made in our original report.

As set out in this report, our opinions in our original 2018 report remain unchanged. With respect to Dr. Kaltofen's supplemental report, it is our opinion that⁷:

- **Our original opinions are further substantiated by the “new” Texas background soil datasets referenced by Dr. Kaltofen. There is no evidence of Arkema-derived contamination in the proposed Class Area based upon these datasets.**

- Only 3% of the plaintiffs' ~120 soil samples collected from the proposed Class Area contained dioxins or PAHs at concentrations above the “new” Texas background soil datasets referenced by Dr. Kaltofen.⁸
- Nearly all of the plaintiffs' experts' ~120 surface soil samples contain concentrations of dioxins, PAHs, and other alleged Arkema-derived chemicals (to the extent that these chemicals were detected) at or below typical background concentrations. Specifically,
 - 97% of soil samples (118 of 122) from the proposed Class Area contain dioxins at concentrations within the range of the Texas rural soil background datasets referenced by Dr. Kaltofen, even after conservatively substituting laboratory detection limits for non-detected dioxin analytes.
 - 97% of soil samples (113 of 116) from the proposed Class Area contain PAHs at concentrations within the range of the Texas (El Paso) soil background dataset referenced by Dr. Kaltofen.



■ Within Background Range
■ Above Background Range

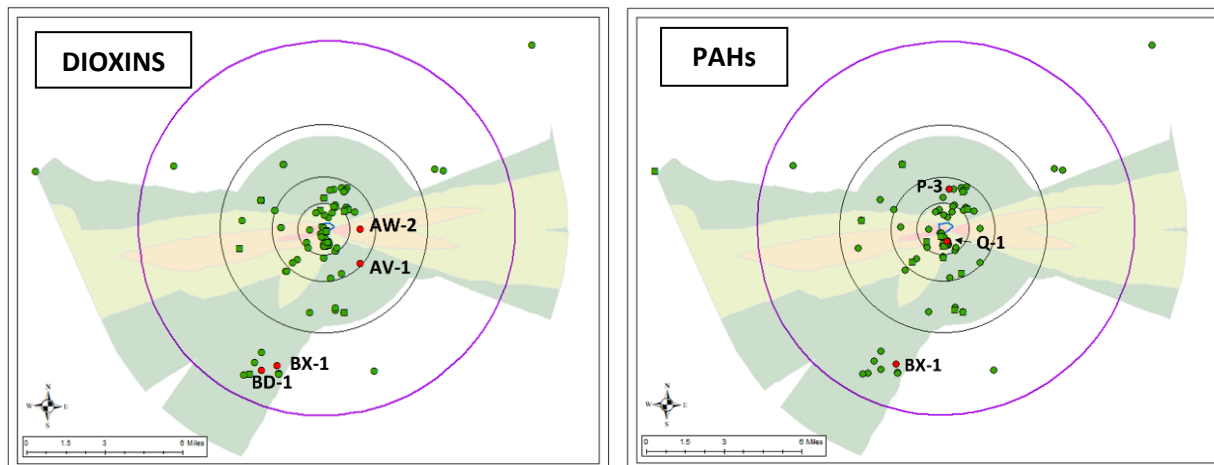
Only 3% of the plaintiffs' ~120 soil samples contained dioxins or PAHs at concentrations above background in the Texas soil datasets referenced by Dr. Kaltofen.

⁷ We specifically address four chemical groups that Dr. Kaltofen discusses in his supplemental (2021) report: dioxins, PAHs, custom-SVOCs, and cyanide, the latter of which was not previously included in his original (2018) or rebuttal (2018) reports. We provide particular emphasis on dioxins since, according to the plaintiffs' risk assessment expert, Ms. Thompson, only dioxins are Constituents of Potential Concern (COPC) within the proposed Class Area; i.e., PAHs, custom-SVOCs, cyanide and metals are not COPCs within the proposed Class Area. (Expert report of Shannon Thompson, Arkema Facility and Surrounding Areas, Crosby, Texas. Dated July 15, 2021).

⁸ This analysis is based upon the data presented in plaintiffs experts' reports and/or reliance materials, but we understand there may be quality issues with these data—including that the data has not been validated. See Expert Report of Dana H. Hebert (October 5, 2018).



- The spatial distributions of soils containing varying concentrations of dioxins, PAHs, and other alleged Arkema-derived chemicals from the proposed Class Area bear no spatial relationship to (a) the Arkema facility or (b) the new cumulative particulate matter deposition map prepared by plaintiffs' modeling expert Dr. Auberle.⁹
- The absence of these spatial relationships is overwhelming evidence that plaintiffs' conceptual site model for impact due to the Arkema events is scientifically deficient and unsupportable. The following maps graphically illustrate how the spatial distribution are contrary to the assertions of Dr. Kaltofen and plaintiffs.



Maps showing the locations of ~120 soil samples collected by plaintiffs' experts analyzed for dioxins (left) and PAHs (right) superimposed on the 7-mile radius proposed Class Area (purple circle) and Dr. Auberle's cumulative particulate deposition map. Green sample points are within the range of Texas background concentrations and red sample points are above Texas background concentrations, as referenced by Dr. Kaltofen.

- A more detailed explanation of these maps/data is included in Section 3 below. But, in summary, as is evident from the maps:
 - The concentrations of dioxins and PAHs in soils are not any higher closer to the Arkema facility than they are further away. In fact, the dioxin and PAH concentrations in nearly all of the soil samples collected close to the Arkema facility are within the range of Texas background concentrations.
 - The concentrations of dioxins and PAHs in soils are not any higher within the areas that Dr. Auberle alleges received 1000 times more Arkema-derived particulate deposition than other areas (red and pink areas in the maps above). In fact, the dioxin and PAH concentrations in nearly all of the soil samples located within Dr. Auberle's high areas of particulate deposition are within the range of Texas background concentrations.

⁹ Auberle, W.M. (2021) Dispersion and deposition of particulate matter from explosions and fires in August and September 2017 at Arkema plant, 18000 Crosby Eastgate Rd., Crosby, Texas; dated July 14, 2021.



- The very few soil samples that do contain dioxins or PAHs above the Texas background concentrations (red sample points in the maps above) occur randomly within the proposed Class Area, indicating they derive from local, perhaps property-specific sources, but certainly not a class-wide or Arkema-derived source.
- **The chemical fingerprints of dioxins or PAHs in the alleged Arkema source materials (e.g., ash and “black goo”) are not unique compared to other sources and/or do not match the chemical fingerprints found in allegedly impacted soils and other sample matrices from the proposed Class Area. This further shows that dioxins or PAHs in the proposed Class Area cannot be attributed to the alleged Arkema source materials.**
 - The average dioxin chemical fingerprints of samples within the proposed Class Area are consistent with many common sources of dioxins, including ambient, background dioxins in U.S. soil and air as reported by the U.S. EPA. In addition, the specific fingerprints of alleged Arkema source materials (ash and “black goo”) collected by plaintiffs’ experts are variable among themselves and different from the chemical fingerprints in allegedly impacted soils from the proposed Class Area.
 - In the case of PAHs, the chemical fingerprints of the alleged Arkema sources (ash and “black goo”) are different from the chemical fingerprints in allegedly impacted soils from the proposed Class Area that exceed Texas background concentrations referenced by Dr. Kaltofen.
- **Dr. Kaltofen continues to make scientifically inappropriate and misleading “apples-to-oranges” comparisons (solids *versus* soils), even when his comparison is now based on his the “new” Texas background soil benchmarks instead of his original single background soil sample (CK-1).**
- **Dr. Kaltofen relies upon inconsistent dioxin toxic equivalency concentration (TEQ) data for certain of his opinions regarding dioxins. Specifically, rather than calculating the TEQs himself, he erroneously compiled them from two separate lab sources that used different, incompatible toxicity equivalency factors (TEFs) to calculate the TEQs. Thus, his TEQs are a collection of incompatible data that cannot be reliably intra-compared, nor compared to published TEQ benchmarks (e.g., for Texas background soils). Any conclusions and opinions Dr. Kaltofen makes regarding dioxins that rely upon his compilation of TEQs are not based on scientifically reliable data.**
- **Dr. Kaltofen unsuccessfully attempts to rule out two alternative sources of PAHs and continues to ignore alternative sources of PAHs and other alleged Arkema-derived chemicals, including dioxins.**
 - Dr. Kaltofen ignores the impacts of backyard burning of residential trash and yard waste in burn barrels and burn piles, which are recognized as the largest source of dioxins in the U.S. As noted previously, 10 instances of backyard burning of residential trash were observed in the Class Area during only a 5-day period in September 2017, and testimony from one of the former class representatives acknowledged the practice in the area. Dr. Kaltofen also fails to consider any other alternative sources of dioxins in the proposed Class Area.



- Dr. Kaltofen's blanket claim that oil and gas operations do not contribute PAHs to air emissions is false and inconsistent with published literature.
- Dr. Kaltofen assesses the Crosby area's four Toxic Release Inventory (TRI) facilities as the universe of potential alternative sources, but this evaluation is too limited and, in any event, irrelevant because it relies upon illogical comparisons and an over-simplified spatial assessment of the available soil data while ignoring all other potential sources.

Finally, we respond as follows on the third and fourth topics in Dr. Kaltofen's supplemental report. First, in regard to persistence, we acknowledge that dioxins and PAHs are persistent chemicals in the environment, which is precisely why they are found at background concentrations throughout the environment. Second, notwithstanding Dr. Kaltofen's superficial consideration of the scientific literature related to a complex issue, in regard to the issue of resuspension and tracking of contaminants in residential soils into homes, we consider this to be irrelevant given 97% of the soils within the proposed Class Area contain dioxins and PAHs consistent with Texas background concentrations.



Section 2: Assessing Background Concentrations versus Contamination

Dioxins and PAHs are different classes of organic chemicals. Both, however, are ubiquitous in the environment and are therefore almost always present at some background concentration. The U.S. EPA recognizes the critical role of evaluating background concentrations of these and other chemicals in assessing the potential impacts of emissions from a site/event – such as the Arkema events – and has published guidance on establishing background conditions.^{10,11,12}

We evaluated the issue of background in our original (2018) report and, in particular, we critiqued the near-complete lack of background sampling conducted by Dr. Kaltofen in his assessment of the Arkema events' impact on the Crosby area. We concluded:

Dr. Kaltofen's assessment of background conditions was grossly inadequate for his objective. His reliance on data from only one soil sample collected outside the proposed Class Area 11 months after the Arkema events, while also ignoring relevant published datasets, falls well short of generally accepted, scientific practice for establishing background conditions.¹³

In the absence of any useful background data from the Crosby area collected by plaintiffs experts, our original (2018) report compared the concentrations of dioxins and PAHs measured in ~120 soil samples collected by plaintiffs' experts in the proposed Class Area (Appendix B)¹⁴ to large, published datasets for background dioxins and PAHs in U.S. soils.^{15,16} This comparison was appropriate not only because of the availability of these large published datasets, but also because the plaintiffs' experts contend that these chemicals' concentrations were measurably increased above "*normal background*" throughout the proposed Class Area due to the Arkema events.¹⁷ Our comparisons to the large published background datasets showed that:

Dioxin and PAH concentrations measured in plaintiffs' soil samples from the proposed Class Area are consistent with typical background soils in the U.S.^{18,19}

¹⁰ EPA. (2002). Guidance on choosing a sampling design for environmental data collection. EPA QA/G-52. Office of Environmental Information, Washington DC.

¹¹ EPA (1995). Establishing background levels. EPA/540/F-94/030. Office of Solid Waste Management, Washington DC.

¹² EPA (2002) Guidance on comparing background and chemical concentrations in soil for CERCLA sites. EPA/540-R01-003. Office of Emergency and Remedial Response, Washington, DC.

¹³ Stout et al. (2018), Opinion [1g], p. 25

¹⁴ Appendix B contains an inventory of plaintiffs' (soils and solids) samples for which chemical data are available. It includes total concentrations of dioxins, PAHs, custom-SVOCs, cyanides, and "marker" metals for all (soils and solids) samples analyzed by plaintiffs. It is noteworthy that our compilation of plaintiffs' data identifies data reported by some plaintiffs' experts but not others, and vice versa. As was the case in our original (2018) report, we included and considered in this report all of plaintiffs' experts data made available to us, including data provided in 2018.

¹⁵ EPA. (2003). Exposure and human health reassessment of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and related compounds. Publ. EPA/600/P-00/001. Office of Research and Development, Washington, DC. This is the largest study of PCDD/Fs in background soils we are aware of and included over 600 soils from rural (319) and urban (305) settings.

¹⁶ Electric Power Research Institute (2004) Polycyclic aromatic hydrocarbons (PAHs) in surface soils in Illinois; Background PAHs. Dec. 27, 2004. Publication No. 1011376, EPRI, Palo Alto, California. Available on-line. This is the largest study of PAHs in background soils we are aware of and included 160 soils from non-urban settings.

¹⁷ Kaltofen, M. (2018), rebuttal report, p. 4.

¹⁸ Stout et al. (2018), Opinion [1b], p. 32

¹⁹ Stout et al. (2018), Opinion [3b], p. 46



In Dr. Kaltofen's (2021) supplemental report, he refers to a limited number of smaller published datasets or reported values for dioxin and PAH background soil concentrations that he alleges demonstrate impact of these chemicals within the proposed Class Area. He predominantly refers to two datasets collected for soils from Texas. We assess the new information presented in Dr. Kaltofen's supplemental report on dioxins and PAHs in Sections 2.1 and 2.2 below.

Dr. Kaltofen also revisits his original (2018) report's assessment regarding the alleged impact of so-called "custom-SVOCs" and, for the first time, the alleged impact of cyanides due to the Arkema events. These two chemical groups are addressed in Sections 2.3 and 2.4 below.

Dr. Kaltofen does not revisit the plaintiffs' Complaint claim surrounding the alleged impact of four so-called "marker metals" (aluminum, barium, calcium, and zinc)²⁰ from the Arkema events, which we rebutted in our original (2018) report.²¹ Neither are these "marker metals" considered by plaintiffs' human health risk expert Ms. Thompson to be Constituents of Potential Concern. Therefore, we do not revisit the issue of "marker metals" herein and reaffirm our prior opinions.

Section 2.1: Dioxins

Commentary on Dr. Kaltofen's Dioxin Data – Mixing TEQs from Different TEFs

Before considering Dr. Kaltofen's new assessment regarding dioxins in the proposed Class Area, it is important to note that there are fundamental errors in the data he used for making comparisons with background or other datasets. Specifically, Dr. Kaltofen erred in compiling his dioxin toxic equivalency concentration (TEQ) data. TEQs are weighted quantities based on the toxicity of each member of the dioxin and dioxin-like compounds group of chemicals relative to 2,3,7,8-TCDD, which is the most toxic member of the category. Raw concentration values for each of the 17 dioxin and furan isomers are multiplied by the congener's respective toxicity equivalency factor (TEF), and then summed to yield a TEQ, usually expressed in units of nanograms per kilogram (ng/kg) or parts per trillion (ppt) TEQ.

Among the benefits of converting raw dioxin concentration data to TEQ is the ability to compare measured TEQ concentrations with published TEQ benchmarks for different media, including soil. In Dr. Kaltofen's supplemental report, he compares his TEQs for soil samples (and other media) from the proposed Class Area to urban and rural background TEQ concentrations reported in an article published by Urban et al.²² The Urban et al. compilation of TEQs is based upon World Health Organization (WHO) TEFs updated in 2005 and reported in 2006 (WHO₂₀₀₆).²³ However, Dr. Kaltofen's compilation of TEQs²⁴ for the samples collected by plaintiffs' experts is based on a mixture of TEQs calculated using different TEFs. Some of the TEQs that he used were calculated using older International Toxicity Equivalency Factors (I-TEF) developed by the North Atlantic

²⁰ Second Amended Complaint; para. 68.

²¹ Stout, S.A. et al. (2018), Opinion 5, p. 56-61.

²² Urban, J.D. et al. (2014). A review of background dioxin concentrations in urban/suburban and rural soils across the United States: Implications for site assessment and the establishment of soil cleanup levels. *Sci. Tot. Env.* 466-467: 586-597.

²³ Van den Berg, M. et al. (2006). The 2005 World Health Organization reevaluation of human and Mammalian toxic equivalency factors for dioxins and dioxin-like compounds. *Tox. Sci.* 93(2), 223–241.

²⁴ Kaltofen reliance material (2021). Arkema_database_08042018 revised 02152019.XLS.



Treaty Organization in 1988 (1998 I-TEFs),²⁵ while another set of TEQs he used were based on contemporary WHO₂₀₀₆ TEFs. The result is that his compilation of TEQs is an incompatible collection of mis-matched TEQs, which he then compares against Urban et al.'s rural and urban soil background TEQ benchmarks that are based upon WHO₂₀₀₆ TEFs. His failure to recognize this error is puzzling because the plaintiffs' other experts Mr. Glass and Ms. Thompson appropriately recomputed TEQs for all of the plaintiffs' data using the WHO₂₀₀₆ TEFs, thereby making the TEQs intra-comparable and, in the case of plaintiffs' soil samples, comparable to urban and rural background benchmark TEQs compiled by Urban et al.

Dr. Kaltofen's error is important because the differences between TEQs calculated using the 1998 I-TEFs and the WHO₂₀₀₆ TEFs can be significant. Not surprisingly, the TEQ results for certain dioxin samples that Dr. Kaltofen references in his supplemental report are significantly different than those presented by Mr. Glass and Ms. Thompson (Table 1). For example, Dr. Kaltofen's TEQ for drywall sample N-1 is 977 ppt whereas Glass/Thompson's TEQ is 653 ppt. Dr. Kaltofen's TEQ for soil sample AV-1 is 141 ppt, compared to Glass/Thompson's TEQ of 78.4 ppt. Dr. Kaltofen's TEQ for soil sample BD-1 is 101 ppt, compared to Glass/Thompson's TEQ of 37.9 ppt. Other examples such as these pervade Dr. Kaltofen's project database.²⁰

Table 1. Examples of TEQs reported by Dr. Kaltofen compared to those computed by Glass/Thompson and verified by NewFields.

Sample ID	Matrix	Kaltofen TEQ (ppt)	Kaltofen TEF source	Glass/Thompson TEQ (ppt)	Glass/Thompson TEF source
N-1	Drywall	977	I-TEF (1988)	653	TEF (WHO ₂₀₀₆)
AW-2	Soil	42.1	I-TEF (1988)	32.8	TEF (WHO ₂₀₀₆)
AV-1	Soil	141	I-TEF (1988)	78.4	TEF (WHO ₂₀₀₆)
BX-1	Soil	90.6	I-TEF (1988)	71.0	TEF (WHO ₂₀₀₆)
BD-1	Soil	101	I-TEF (1988)	37.9	TEF (WHO ₂₀₀₆)

These mismatches of TEQs in Dr. Kaltofen's database²⁶ are pervasive among arguably his most important samples—i.e., the plaintiffs' soil samples that he compares to Urban et al.'s compilation of background TEQ concentrations for rural and urban soils. Eighty percent (80%) of Dr. Kaltofen's plaintiffs' soil sample TEQs are based on the outdated 1988 I-TEFs, while only 20% of his plaintiffs' soil sample TEQs are based on WHO₂₀₀₆ TEFs.

Our assessment reveals the source of Dr. Kaltofen's incompatible assembly of TEQ data can be traced to how he compiled the data. Specifically, the plaintiffs' experts' dioxin data was produced by two different laboratories—SGS/Accutest and ALS Laboratory. SGS/Accutest calculated and reported TEQs based on the outdated 1988 I-TEFs, while ALS Laboratory calculated and reported TEQs based on WHO₂₀₀₆ TEFs. Dr. Kaltofen did not independently calculate the TEQs contained within his database, rather he simply transcribed the TEQs from the two laboratories' reports without recognizing that they computed TEQs using different TEFs. Thus, he erroneously

²⁵ Kutz, F.W. et al. (1990). The international toxicity equivalency factor (I-TEF) method for estimating risks associated with exposures to complex mixtures of dioxins and related compounds. Tox. Env. Chem. 26: 99-109.

²⁶ Kaltofen reliance material (2021). Arkema_database_08042018 revised 02152019.XLS.



commingled incompatible TEQs, making his collection of TEQ data incompatible, inaccurate, and scientifically unreliable. As such, we conclude that:

Dr. Kaltofen's TEQ database for plaintiffs' samples is a collection of "apples and oranges" that cannot be reliably intra-compared, nor dependably compared against published benchmarks, such as the Urban et al. urban and rural soil background benchmarks.

Dioxin Concentrations in the Proposed Class Area Soils versus Texas Background Soils

In Dr. Kaltofen's supplemental report, he refers to, for the first time, a published paper by Urban et al. (2014)²⁷ that compiled dioxin TEQs for rural background soils (291 total samples) and urban background soils (615 total samples) from 26 separate studies within the United States. Three studies referenced in Urban et al. were conducted by the Texas Commission of Environmental Quality (TCEQ) and included data for dioxin concentrations in soils from both rural and urban settings in Texas.^{28, 29, 30} Dr. Kaltofen attempts to use this TCEQ data to support his theory that the proposed Class Area has been impacted by dioxins from the Arkema events. Dr. Kaltofen makes the sweeping (and unsupported) statement that:

"Soil samples collected within seven miles of Arkema had higher TEQ concentrations than these Texas average background levels of TEQ in parts per trillion."³¹

However, as demonstrated below, we find:

When the dioxin concentrations in all 122 of the plaintiffs' soil samples are compared to the results of TCEQ soil background studies, Dr. Kaltofen's statement is unequivocally false.

In reaching this conclusion we first point out that our "apples-to-apples" comparison is made using TEQs calculated using only the WHO₂₀₀₆ TEFs that we independently computed and compiled for the plaintiffs' soil samples and other matrices (Appendix B), rather than Dr. Kaltofen's mismatched and scientifically inaccurate values. Additionally, we replaced any non-detected dioxin concentrations with the laboratory's detection limit concentration—thus affording the most conservative estimate of TEQ in the soil samples from the proposed Class Area as plaintiffs' experts (Mr. Glass and Ms. Thompson) have done. *Although we do not agree with this approach because it results in apparent detections of dioxins even though none were detected by the*

²⁷ Urban, J.D. et al. (2014). A review of background dioxin concentrations in urban/suburban and rural soils across the United States: Implications for site assessment and the establishment of soil cleanup levels. *Sci. Tot. Env.* 466-467: 586-597.

²⁸ TCEQ (Texas Commission of Environmental Quality). (1995a). Toxicological Evaluation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) concentrations in soil samples collected in the vicinity of six Texas cities (Center, Carthage, Cleburne, Terrell, Quitman, and Midlothian). Interoffice Memorandum, October 16, 1995.

²⁹ TCEQ (Texas Commission of Environmental Quality). (1995b). Sampling and analysis of soils for TCDDs and PCDFs from six Texas cities. Prepared by Southwest Research Institute. SwRI Project No. 01-6679.

³⁰ TCEQ (Texas Commission of Environmental Quality). (1997). Toxicological evaluation of the 1996 results of soil sampling for dioxins/furans in the vicinity of five municipal/medical waste incinerators. Amarillo, Terrell, Center, Pearland, and Galveston. Sampling conducted December 2–8, 1996. Interoffice Memorandum, July 7, 1997.

³¹ Kaltofen, M. (2021), p. 8.



laboratory, we utilize this approach to afford an apples-to-apples comparison to the TCEQ soil background datasets referenced by Dr. Kaltofen.

In his supplemental report, Dr. Kaltofen quotes from the Urban et al. paper summarizing the findings of the three TCEQ soil background studies:

“TEQ₂₀₀₆ concentrations were found to range from 0.8 to 22.6 ng/kg (mean 7.1 ng/kg) in rural soils and from 6.2–7.2 ng/kg (mean 6.7 ng/kg) in urban samples.”

We agree that these TCEQ soil background data ranges can be used to put the plaintiffs’ soil data in perspective, but only when all 122 of these soil samples are considered. Figure 1 below shows a histogram of the number of soil samples from the proposed Class Area as a function of their TEQ concentrations.

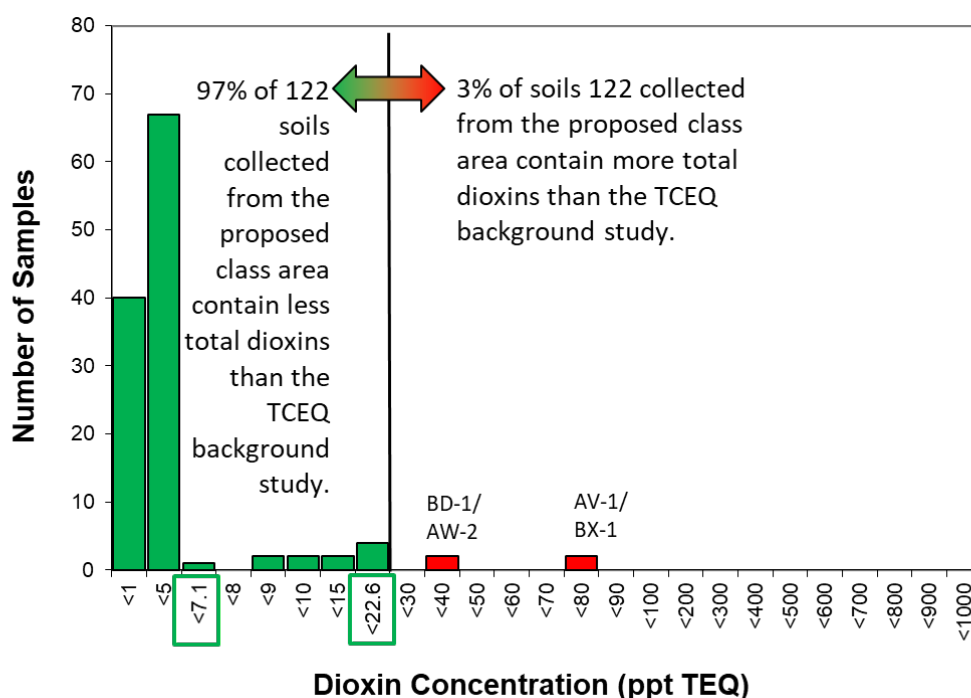


Figure 1: Histogram showing the concentration of dioxins (in ppt TEQ) for all 122 soil samples collected from the proposed Class Area analyzed for dioxins. Green bars depict samples within the range of TEQ concentrations reported by TCEQ for rural soils in Texas, as referenced by Dr. Kaltofen. TCEQ mean (7.1 ppt) and maximum (22.6 ppt) are depicted in green boxes. Red bars depict (four) samples (BD-1, AW-2, AV-1, and BX-1) containing TEQ concentrations above the TCEQ maximum (22.6 ppt). All TEQs are based upon WHO 2006 TEFs with all non-detects set to the laboratory detection limit.

This figure’s horizontal axis highlights (green boxes) the mean and maximum TEQ concentrations from the TCEQ rural soil background studies, 7.1 and 22.6 ppt, respectively.³²

The following statistics are evident:

- 86% of the soil samples (108 of 122) have a LOWER TEQ than the TCEQ’s mean background TEQ for rural Texas soils (< 7.1 ppt);

³² Because mean values were reported in the TCEQ studies, it should be emphasized that some background soils will contain TEQ concentrations that are less than the mean and others will contain concentrations that are more than the mean.



- 97% of the soil samples (118 of 122) have a LOWER TEQ than the TCEQ's maximum background TEQ for rural Texas soils (< 22.6 ppt);
- Only 3% of the soil samples (4 of 122) have a HIGHER TEQ than the TCEQ's maximum background TEQ for rural Texas soils (22.6 ppt); and
- The mean TEQ for all 122 soil samples from the proposed Class Area (4.3 ppt) is LOWER than the TCEQ's mean background TEQ for rural Texas soils (7.1 ppt).

The four soil samples that have TEQ concentrations greater than the TCEQ's rural Texas soil maximum of 22.6 ppt TEQ [AW-2 (32.8 ppt), BD-1 (37.9 ppt), BX-1 (70.96 ppt) and AV-1 (78.4 ppt)] each still have lower TEQs than the upper limit reported by Urban et al. for all U.S. urban soils (186.2 ppt).

While the immediate Crosby area is rural in nature, it is located within 30 miles of highly urbanized and industrialized Houston. Therefore, Crosby is within an air shed whose air quality is poor and tied to emissions and air quality from the metropolitan Houston area. Since atmospheric fallout is a significant source of dioxin to rural and urban soils, it is reasonable to hypothesize, for the purpose of considering the levels of dioxins in soils, that Crosby falls between true rural and urban conditions. Therefore, the four samples with a TEQ greater than the TCEQ's maximum background for rural soils (22.6 ppt) but lower than the urban background limit of 186.2 ppt could likely be due to urban-like impacts to the Crosby area. An alternate and equally likely explanation for the four samples with TEQs greater than the TCEQ's maximum background TEQ for rural Texas soils is that those four soils are impacted by localized, perhaps property-specific dioxin sources (e.g., indiscriminate backyard burning, residues of treated wood in soil, residues of certain pesticides such as pentachlorophenol, which are known to contain dioxins, etc.) – as described in our original (2018) report.³³

Thus, an unbiased assessment of the Urban et al. published dataset, and specifically the TCEQ's rural Texas background soils dataset, allows us to conclude:

Dr. Kaltofen's newly introduced literature references regarding dioxin concentrations in background soils from Texas do not support his contentions and, in fact, reaffirm our original opinion that soils within the proposed Class Area were not measurably impacted by dioxins from the Arkema events.

Dioxin concentrations in soils within the proposed Class Area are still overwhelmingly consistent with background concentrations measured in U.S. soils, including those measured in Texas.

The available data provides no evidence for any area wide dioxin impact from the Arkema events.

Dr. Kaltofen's Inappropriate Comparisons – Non-Soil Matrices versus Soil Benchmarks.

In a table on page 8 of his supplemental report, Dr. Kaltofen compares dioxin TEQ data for soils and certain non-soil matrices with Urban et al.'s average TEQ values for rural and urban soils. While this table contains data for soils, it also contains data for solid (non-soil) samples collected by plaintiffs' experts, including CT-1 (vacuum cleaner dust), and N-1 (drywall). In another example of his "apples-to-oranges" comparisons, Dr. Kaltofen misleads the reader into thinking

³³ Stout, S.A. et al. (2018), p. 10-14 and Table 3.



that all of the samples in his table are soils and therefore comparable to Urban et al.'s soil benchmarks. Specifically, in a preamble to the table, he writes:

"People are exposed to higher dioxin concentrations within the class than they would be if they were exposed to background concentrations of dioxins. Soil samples collected within seven miles of Arkema had higher TEQ concentrations than these Texas average back-ground levels of TEQ in parts per trillion (Table below, data from BCD 2018)."

Aside from the aforementioned problems with his mis-matched TEQ data, Dr. Kaltofen's inappropriate "apples-to-oranges" comparisons between Urban et al.'s benchmarks for rural and urban soils with TEQs measured in non-soils such as vacuum cleaner dust and drywall are illogical and are scientifically flawed.³⁴ As we have repeatedly stated, such comparisons are blatantly misleading since soil, any soil, would be expected to contain much lower concentrations of any chemicals compared to the "pure" solid samples due to the diluting effect of mineral and/or organic matter in soil.³⁵

Urban et al.'s benchmarks were developed strictly from evaluating dioxin TEQ measured in soil and were not intended to be compared to other natural or man-made matrices. Not only is the very nature of the non-soil matrices different than mineral-rich soil, but the non-soil matrices can also contain chemicals that were intentionally or inadvertently added to them (e.g., drywall), or contain chemicals that became entrained in them in an indoor setting with its own localized sources of contamination (e.g., vacuum cleaner dust).

In the table on page 8 of his supplemental report, Dr. Kaltofen insinuates that the dioxin measured in the non-soil samples were elevated and representative of impacts of the Arkema events.³⁶ Such claims are inaccurate and not scientifically defensible. In fact, an evaluation of dioxin concentrations measured in plaintiffs' experts' non-soil samples (including not only of vacuum cleaner dust and dry wall, but also "black goo," ash, grass and hay, ground- and surface water, and wipe samples) has already been thoroughly explained in our original (2018) expert report,³⁷ and need not be repeated here.

In summary, we rule out Dr. Kaltofen's comparison of TEQ measured in non-soil matrices to published soil TEQ benchmarks as scientifically unjustified and blatantly misleading. Our original (2018) report's analyses of dioxins found in solid (non-soil and aqueous) matrices leads us to reaffirm our original opinion:

Solid (*non-soil*) samples analyzed for dioxins and discussed or referenced by Dr. Kaltofen do not provide evidence of impacts across the proposed Class Area from a dioxin point source.

³⁴ See Figure 2 for an "apples-to-apples" comparison of dioxins in the proposed Class Area soils *versus* background soils.

³⁵ Stout, S.A. et al. (2018), Opinion 1g, p. 26; Opinion 1h, p. 27; Opinion 4b, p. 53.

³⁶ In his table he also cherry-picked the only four soils that contained higher TEQs than the TCEQ studies' maximum. He ignored the other 118 soils that contained much lower TEQs than the TCEQ maximum; see Fig. 2.

³⁷ Stout, S.A. et al. (2018), Opinion 2c, p. 35-43.



Dioxins in “Pure” Ash Samples

As described further in Section 6, the plaintiffs’ experts’ conceptual site model contends that ash from the Arkema events carried and deposited contaminants, including dioxins, throughout the proposed Class Area. On page 8 of his supplemental report, Dr. Kaltofen states that ash sample U-1:

“had high dioxin levels, with a mid-point TEQ (WHO 2005) of 15 ppt, which was just below the onsite value of 18 ppt for sample DD-4. DD-4 was a mixed soil and fire debris sample, not an ash source material.”

First, the ash sample U-1 contained no detectable concentrations of the most toxic dioxin congeners.³⁸ Dr. Kaltofen’s alleged “high dioxin levels” for the U-1 ash sample assumed these congeners to be present at half the laboratory detection limit, resulting in an artificially high mid-point TEQ. Conversely, the DD-4 soil/“black goo” sample³⁹ authentically contained measurable concentrations of these most toxic congeners. Thus, contrary to Dr. Kaltofen’s quote (above), the U-1 ash sample’s TEQ is not comparable to the DD-4 soil/“black goo” sample’s TEQ and his comparison is wrong and misleading.

Second, Dr. Kaltofen fails to mention that plaintiffs’ experts collected several other ash samples that were analyzed for dioxins. Table 2 lists these other samples, and their TEQs computed using the WHO₂₀₀₆ TEFs presented in two fashions: Column 1, substituting zero for non-detected dioxin congener values and Column 2, substituting the detection limit for non-detected PDD/F congeners (in a manner consistent with the approach used by plaintiffs’ experts, Mr. Glass and Ms. Thompson). In the first case, zero substitutions for non-detected dioxin congeners allow for identification of TEQ values driven only by true detections of dioxin compounds (rather than assuming that “non-detections” were authentic detections at concentrations equal to the laboratory’s detection limit). This is consistent with the U.S. EPA’s approach for evaluating background concentrations of dioxins in environmental media,⁴⁰ and the approach we used in our original (2018) expert report. In the second case, substituting the laboratory’s detection limit for non-detected dioxin congeners offers a means to compare highly conservative estimates of ash samples’ TEQs to highly conservative estimates of plaintiffs’ soil TEQs as calculated by plaintiffs’ experts, Mr. Glass and Ms. Thompson.

³⁸ 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, and 2,3,4,7,8-PeCDF (per WHO, 2005)

³⁹ DD-4 was a mixture of soil and “black goo” (Thompson, 2018, Ex. 4, p. 17)

⁴⁰ EPA. (2003). Exposure and human health reassessment of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and related compounds. Publ. EPA/600/P-00/001. Office of Research and Development, Washington, DC.

**Table 2. Dioxin TEQs computed for plaintiffs' experts' ash samples.**

TEQ concentrations in ppt; DL=detection limit

	Column 1	Column 2
Ash Sample ID	TEQ (WHO ₂₀₀₆) ND = 0	TEQ (WHO ₂₀₀₆) ND = DL
CE-1	0.57	2.28
E-1	0	22.3
F-1	0	4.30
T-1	0.01	2.11
U-1	5.12	25.3

The data in Column 1 shows that the five ash samples contain few if any real detections of dioxins. In fact, two of the samples (E-1 and F-1) contained no detectable dioxin congeners. Clearly, the data in Column 1 show that:

The plaintiffs' experts' ash samples, i.e., their alleged source of dioxins within the proposed Class Area, are not measurable sources of dioxins in the proposed Class Area.

The data in Column 1 also demonstrate that even when very low concentrations of dioxins were detected in ash, the results were highly variable. Significantly, as a result, no one ash sample can adequately represent ash found in soils from the proposed Class Area. This conclusion is further described and supported based on the dioxin chemical fingerprints of ash *versus* soils from the proposed Class Area discussed in Section 4.1 below.

Even when using the highly conservative approach of substituting the detection limit for non-detected dioxins as followed by plaintiffs' experts (Column 2), three of the five *ash* samples contain TEQs equal to or lower than the average of plaintiffs' *soil* samples from the proposed Class Area (4.3 ppt TEQ; see discussion above). Even if the soils in the proposed Class Area were composed of 100% ash (an obvious impossibility), the TEQ levels would be lower than the TCEQ's mean or maximum TEQs for Texas rural background soils (7.1 or 22.6 ppt TEQ, respectively; see discussion above and Fig. 1) for four of the five ash samples; the fifth ash sample (U-1) would be only barely above the rural background maximum (22.6 ppt TEQ). Thus, the data shows that:

Even when using the highly conservative approach to estimating TEQ for the "pure" ash samples adopted by plaintiffs' experts, it is simply not possible for the ash to be a measurable contributor of dioxins to the soils within the proposed Class Area.

Based on these facts, the mere visual observation of macroscopic ash at select locations within the proposed Class Area by plaintiffs' experts, notably Mr. Glass, does not mean that the ash was a source, let alone *the* source, of dioxins found in samples throughout the proposed Class Area. The available data (Table 2) shows that even if dioxins were present in the ash, they existed at concentrations too low to account for or measurably contribute to the dioxins measured in soils within the proposed Class Area.

Sample DD-4 and other On-Site Soil Samples

As indicated in Table 1, Dr. Kaltofen classifies sample DD-4, which was collected at the Arkema Facility, as a "mixed soil and fire debris sample," which he implies is impacted by dioxins from the



Arkema events. Absent from his supplemental report is important context regarding this sample, and other on-site soil samples plaintiffs' experts collected at the Arkema facility.⁴¹

In his original (2018) expert report, Dr. Kaltofen presented results for soil samples collected in July 2018 near Building 27 on the Arkema facility. These included sample DD-4 (18.2 ppt TEQ) and CS-1 (9.38 ppt TEQ). Plaintiffs' experts also reported dioxin concentrations for three other on-site soil samples: CQ-1 (4.75 ppt TEQ), CS-2 (8.16 ppt TEQ) and CR-1 (1.27 ppt TEQ).

Collectively, the TEQs measured in these five on-site soil samples are much lower than typical soils from dioxin impacted industrial sites and are, instead, consistent with dioxins found in typical rural and/or urban soils. For example, the range of TEQs measured in all five of plaintiffs' experts' on-site soil samples (1.27 to 18.2 ppt TEQ) fall within the concentration range reported in the TCEQ's study of rural background soils in Texas (0.8 to 22.6 ppt TEQ; as reported by Urban et al.). Thus, the available data show that:

Even the Arkema on-site soils analyzed by plaintiffs' experts are not measurably impacted by dioxins above Texas background levels.

By contrast, dioxin TEQs are typically much higher at industrial sites. For example, U.S. EPA reported dioxin concentrations in soils at a combustion-derived dioxin contaminated municipal waste-to-energy facility in Columbus, Ohio that ranged from 50 to 760 ppt TEQ with an average of 444 ppt TEQ.³³

As originally concluded,⁴² our opinion regarding the on-site Arkema soils remains:

There is no evidence that plaintiffs' soil samples collected from the Arkema facility have been impacted by dioxins from a significant point source, such as is alleged to have occurred during the Arkema events. To the contrary, the data indicate that no significant dioxins were even present on the Arkema facility.

Section 2.2: PAHs – Benzo[a]pyrene and Total PAHs

Before considering Dr. Kaltofen's new assessment regarding the area's background PAH concentrations, it should be noted that he continues to focus on PAHs despite the fact that Ms. Thompson, the expert put forward by plaintiffs to opine on the results of human health risk-based screening level assessment and identification of Constituents of Potential Concern (COPC), concluded that benzo[a]pyrene and, in fact, all PAHs were not COPCs in the ash, assorted solids (e.g., grass, etc.), soil, or indoor dust samples from the proposed Class Area.⁴³ Additionally, we note that Ms. Thompson repeatedly refers to the same large, published dataset for background PAHs in U.S. soils that we had compared against plaintiffs' data in our original (2018) report in reaching her opinion that PAHs were not COPCs.

Nonetheless, Dr. Kaltofen attempts to demonstrate otherwise through comparisons or references to other published datasets (discussed below), although he mostly refers to a study of soils in El Paso, Texas.⁴⁴ This dataset is emphasized by Dr. Kaltofen since it arguably represents a Texas-

⁴¹ TEQ concentrations for the samples in the subsequent discussion were computed using WHO₂₀₀₆ TEFs to maintain comparability with soil sample data presented in this report (and Fig. 1).

⁴² Stout, S.A. et al. (2018), Opinion 2b, p. 34.

⁴³ Thompson, S. (2021), p. 3-5, 3-6, 3-7

⁴⁴ De La Torre-Roche, R.J. et al. (2009) Soil-borne polycyclic aromatic hydrocarbons in El Paso, Texas: Analysis of a potential problem in the United States/Mexico border region. J. Hazard. Mater. 163: 946-958. We will hereafter refer to this study as the "El Paso soil background study".



specific background soil dataset. In reference to this El Paso soil background study results, he states, based upon the concentrations of a single PAH, benzo[a]pyrene, in two of the plaintiffs' experts' samples (Q-1 and BO-4),⁴⁵ "Soil concentrations around the Arkema facility were well above these background levels". However, we find:

When the benzo[a]pyrene concentrations in all 116 of the plaintiffs' soil samples are compared to the El Paso soil background study's results, Dr. Kaltofen's statement is unequivocally false.

This is demonstrated in Figure 2, which shows the concentrations of benzo[a]pyrene in all 116 soil samples collected by plaintiffs' experts within the proposed Class Area that were analyzed for PAHs (Appendix B). This figure's horizontal axis highlights (green boxes) the mean and maximum concentration of benzo[a]pyrene in the El Paso soil background study, 8.4 and 365 ppb, respectively.⁴⁶

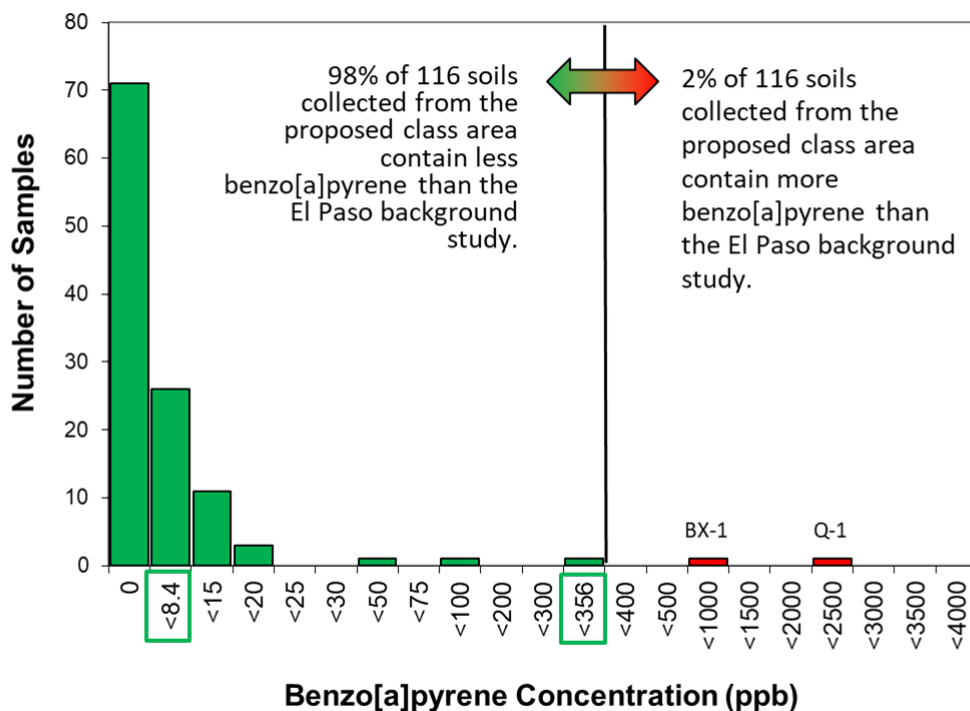


Figure 2: Histogram showing the concentration of benzo[a]pyrene (ppb) for all 116 soil samples collected from the proposed Class Area analyzed for benzo[a]pyrene. Green bars depict samples within the range reported by in Dr. Kaltofen's "new" dataset for El Paso, Texas soils. The El Paso background study's mean (8.4 ppb) and maximum (365 ppb) are depicted in green boxes. Red bars depict (two) samples (BX-1 and Q-1) containing benzo[a]pyrene concentrations above the El Paso study's maximum (365 ppb).

⁴⁵ He neglects to note that one of the two samples (BO-4) is not soil, but rather is a grass sample, whose concentration should not be compared to soil background. This is one example of the "apples-to-oranges" comparisons Dr. Kaltofen repeatedly makes in his original, rebuttal, and supplemental reports.

⁴⁶ Because mean values were reported in the El Paso study, it should be emphasized that some background soils will contain concentrations that are less than the mean and others will contain concentrations that are more than the mean.



The following statistics are evident from the histogram:

- 84% of the soil samples (97 of 116) contain LESS benzo[a]pyrene than the mean of the El Paso soil background study (< 8.4 ppb);
- 98% of the benzo[a]pyrene concentrations in the soil samples (114 of 116) fall within the range of the El Paso soil background study (< 356 ppb);
- The mean for the 114 soil samples from the proposed Class Area containing <356 ppb (6.2 ppb) is LOWER than the El Paso study mean (8.4 ppb).
- Only 2% of the soil samples (2 of 116) contain more benzo[a]pyrene than were reported in the El Paso soil background study.

Thus, Dr. Kaltofen's statement that soil concentrations around the Arkema facility are "*well above these background levels*" is unequivocally false. In fact, nearly all (98%) of the soil samples from the proposed Class Area contain *LESS* benzo[a]pyrene than the El Paso soil background study referenced by Dr. Kaltofen in his supplemental report.

Only two soil samples containing higher concentration of benzo[a]pyrene (Q-1 and BX-1) are arguably anomalous. In Sections 3 and 4 below, we consider these two samples' locations and PAH chemical fingerprints, which demonstrate the benzo[a]pyrene in these two anomalous soil samples is not reasonably attributable to ash or "black goo" deposited from the Arkema events. Even if it was, the rarity of these two soil samples (2 out of 116; < 2%) contradicts any class-wide evidence of impact of benzo[a]pyrene.

In addition to the El Paso soil background study, Dr. Kaltofen briefly refers to two other published studies discussed in each the following two paragraphs.

First, in a single sentence, Dr. Kaltofen refers to another published study that reported a *median* global background concentration of benzo[a]pyrene of 1.9 ppb,⁴⁷ which upon comparison to Figure 2 seems quite low. However, when the details of this global study are considered, its results clearly are inappropriate to compare to the Crosby, Texas area soils. Specifically, Dr. Kaltofen fails to acknowledge that this global study intentionally collected soil samples "*far away from towns and cities*" and "*> 2 km from busy roads*", and, for example, included soil samples collected from a nature preserve in Antarctica, a high-altitude desert in Bolivia, and the Brazilian rain forest! The US EPA defines background as "*samples collected from unimpacted locations that are otherwise comparable to the alleged impacted locations*". Clearly, this study's results are not "*otherwise comparable*" to soils from the Crosby area – and thereby, **represents a misleading assertion by Dr. Kaltofen that this global study's results are somehow relevant to Crosby, Texas soils.**

Second, in another single sentence, Dr. Kaltofen claims the El Paso study's results for benzo[a]pyrene are "*within the range of or even lower than the US and global background data studied by ATSDR (1995, p. 262).*" This statement is technically correct, and if simply accepted, might mislead the reader into thinking it is relevant to the Crosby area. However, when the actual data are compared side-by-side (Table 3) the ranges reported by ATSDR (1995) show that background soils actually can contain much higher concentrations of benzo[a]pyrene than were reported in the El Paso soil background study. Dr. Kaltofen's single sentence (quoted above) fails to mention that ATSDR (1995) reports background soils can contain up to 1,300 ppb

⁴⁷ Nam, J.J. et al. (2009) Polynuclear aromatic hydrocarbons (PAHs) in global background soils. J. Environ. Monit. 11: 45-48.



benzo[a]pyrene, i.e., higher than all but one of the soil samples from the proposed Class Area (Fig. 2). **This demonstrates yet another misleading assertion by Dr. Kaltofen.**

Table 3: Side-by-side comparison of benzo[a]pyrene concentration ranges in the El Paso and ATSDR (1995) soil background studies referred to in Dr. Kaltofen's supplemental report.

	El Paso (2009)	ATSDR (1995)
Rural/Remote	ND – 365	2 – 1,300
Agricultural	ND – ND	4.6 – 900
Urban	ND – 39.5	165 – 220
All Soils	ND - 365	2 – 1,300

ND: non-detect; all concentrations in ppb

Thus, an unbiased assessment of both the El Paso background study results (Fig. 2), the global study results, and the ATSDR (1995) results (Table 3) allows us to conclude:

Dr. Kaltofen's newly introduced literature references regarding benzo[a]pyrene concentrations in background soils do not support his contentions and, in fact, reaffirm our original opinion that soils within the proposed Class Area were not measurably impacted by benzo[a]pyrene from the Arkema events.

Benzo[a]pyrene concentrations in soils within the proposed Class Area are overwhelmingly consistent with background concentrations measured in U.S. soils, including those measured in El Paso, Texas.

In addition to Dr. Kaltofen's emphasis on benzo[a]pyrene (alone), he also refers to and makes comparisons of the total PAH concentrations in the El Paso soil background study (average 116.3 ppb; maximum 2225 ppb) – and three other published background studies.⁴⁸ He states these studies' maximum concentrations of total PAHs were (1) lower than were found in the mean of nine samples collected on-site at the Arkema facility (7,317 ppb) and (2) lower than were found in the two off-site samples (again) called out by Dr. Kaltofen (BO-4 and Q-1, i.e., a grass and soil). These comparisons, however, are very misleading.

First, Dr. Kaltofen's on-site mean concentration (7,317 ppb) was calculated including four solid (non-soil) samples, which, for example, included a "pure" soot sample collected from a loading dock doorframe from the Arkema facility that (as "pure" soot) contained 13,222 ppb total PAHs (DA-1). By including these solid samples with five on-site soil samples he artificially and

⁴⁸ These three studies were referenced within the ATSDR (1995) and are not appropriate for comparison to Crosby soils, but since Dr. Kaltofen thinks they are, we have reviewed these studies. Specifically, Thompson (1986) reports total PAHs in soils from remote wooded areas of Wyoming and both Staples et al. (1985) and Halbrook et al. (1992) refer to total PAHs in sediments – not soils. Thus, comparison to Crosby area soils is hardly appropriate. Regardless the reported maxima in each of these three studies (210, 500, and 950 ppb, respectively) that Dr. Kaltofen deems relevant are each lower than the reported maximum in the El Paso study (2,225 ppb), and higher than 97% (113 of 116) of the soils collected/ analyzed from the proposed Class Area (Fig. 3).



improperly increased the mean, leading to another faulty “apples-to-oranges” comparison. The actual mean for the five on-site soil samples collected was only 376 ppb.⁴⁹

Second, his comparison to only two (of >100) off-site samples, one of which (again) was a solid (BO-4 grass; i.e., again apples-to-oranges), is a biased presentation of the data. **Both these faulty comparisons are examples of Dr. Kaltofen’s cherry-picking data to support his opinions**, which we criticized multiple times in our original (2018) report.⁵⁰

The only appropriate “apples-to-apples” concentration comparisons are between the same matrices, such as soils *versus* soils, which is what we have consistently done. Toward this end, Figure 3 shows the concentrations of total PAHs in all 116 soil samples collected by plaintiffs’ experts within the proposed Class Area that were analyzed for PAHs.

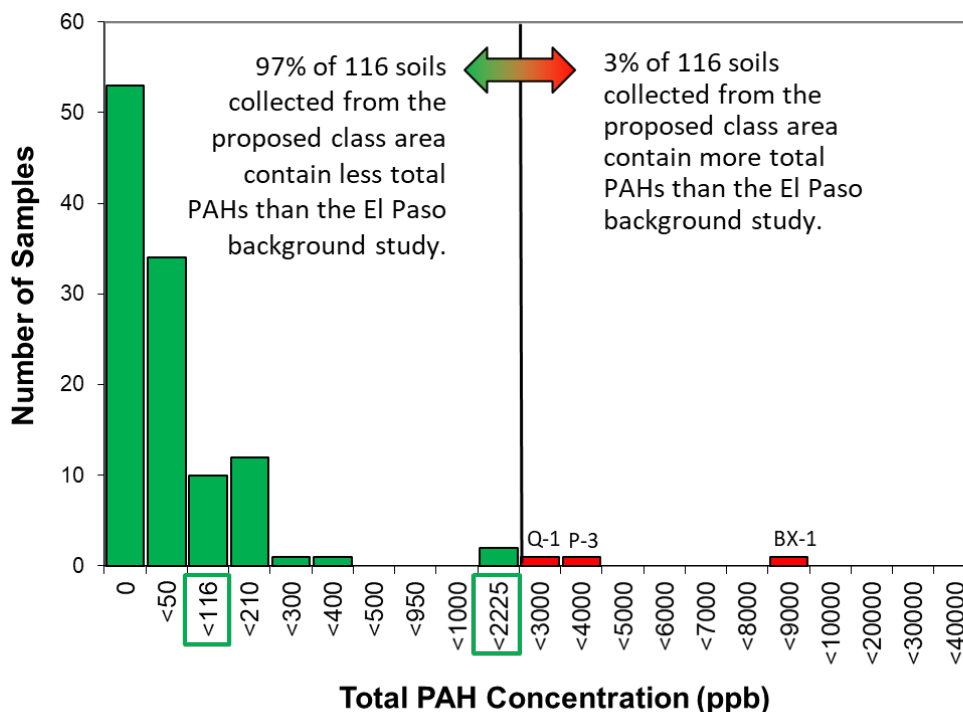


Figure 3: Histogram showing the concentration of total PAHs (ppb) for all 116 soil samples collected from the proposed Class Area analyzed for PAHs. Green bars depict samples within the range reported by in Dr. Kaltofen’s “new” dataset for El Paso, Texas soils. The El Paso background study’s mean (116 ppb) and maximum (2225 ppb) are depicted in green boxes. Red bars depict (three) samples (Q-1, P-3, and BX-1) containing total PAHs concentrations above the El Paso study’s maximum (2225 ppb).

Inspection of Figure 3 shows that 94% (109 of 116) of the soil samples from the proposed Class Area contain LESS PAHs than the actual on-site soil sample mean (<376 ppb). Additionally, several statistics relevant to the El Paso soil background study’s results are evident, including:

⁴⁹ DD-4, CQ-1, CS-1, CS-2, and CR-1. One of these samples (DD-4 has the highest total PAH concentration, 1,378 ppb) was a mixture of soil and “black goo” (Thompson, 2018, Ex. 4, p. 17), but nonetheless, considered a soil for this comparison. If this on-site “soil” sample is omitted, the average total PAH concentration for the remaining four soils is only 125 ppb.

⁵⁰ Stout, S.A. et al. (2018), p. 28, 39, 45, 58.



- 84% of the soil samples (97 of 116) contained LESS PAHs than the mean of the El Paso soil background study (< 116 ppb);
- 97% of the PAH concentrations in the soil samples (113 of 116) fall within the range of the El Paso soil background study (< 2,225 ppb);
- The mean for the 113 soil samples from the proposed Class Area containing <2,225 ppb (63.4 ppb) is LOWER than the El Paso study mean (116 ppb).
- Only 3% of the soil samples (3 of 116) contain higher concentrations of total PAHs than were reported in the El Paso soil background study.

The three soil samples containing anomalously higher concentration of total PAHs (Q-1, P-3, and BX-1) are just that – anomalous. Two of these samples (Q-1 and BX-1) also contained the anomalously high concentrations of benzo[a]pyrene (Fig. 2). In Sections 3 and 4 below, we consider these three samples' locations and PAH (chemical) fingerprints, which will demonstrate the total PAHs in these three anomalous soil samples are not reasonably attributable to ash or “black goo” deposited from the Arkema events. Further even if they were, the rarity of these three soil samples (3 out of 116; 3%) does not support any class-wide evidence of impact of benzo[a]pyrene. Therefore, we conclude:

Dr. Kaltofen's newly introduced literature references regarding total PAH concentrations in background soils do not support his contentions and, in fact, reaffirm our original opinion that soils within the proposed Class Area were not measurably impacted by total PAHs produced and released during the Arkema event.

Total PAH concentrations in soils within the proposed Class Area are still overwhelmingly consistent with background concentrations measured in U.S. soils, including those measured in El Paso, Texas.

Section 2.3: Custom SVOCs

As with PAHs, it is unclear why Dr. Kaltofen again discusses his so-called six “custom-SVOCs” despite the fact that Ms. Thompson, the expert put forward by plaintiffs to opine on the results of human health risk-based screening level assessment and identification of Constituents of Potential Concern (COPCs), did not conclude that any of these six chemicals are COPCs in the ash, assorted solids (e.g., grass, etc.), soil, or indoor dust samples from the proposed Class Area.⁵¹

Nonetheless, in his supplemental (2021) report,⁵² Dr. Kaltofen simply presents the same table of five selected samples' results contained in both his original (2018) and rebuttal (2018) reports.^{53,54} This table retains Dr. Kaltofen's scientifically inappropriate “apples-to-oranges” comparisons between the lone background soil collected outside the proposed Class Area (CK-1) to numerous solid (non-soil) samples (soot, house dust, and ash). As we have repeatedly stated, this comparison is scientifically inappropriate and misleading since soil, any soil, would be expected

⁵¹ Thompson, S. (2021), p. 3-5, 3-6, 3-7

⁵² Kaltofen, M. (2021), p. 9, Table 1.

⁵³ Kaltofen, M. (2018), original report, p. 14, Table 1.

⁵⁴ Kaltofen, M. (2018), rebuttal report, p. 6, Table 1.



to contain much lower concentrations of any chemicals compared to the “pure” solid samples due to the diluting effect of mineral and/or organic matter in soil.⁵⁵

Dr. Kaltofen’s supplemental report provides no new data nor any new bases for us to re-evaluate the custom-SVOC concentration data collected by plaintiffs’ experts. Because these are “custom” chemicals, unlike dioxins or PAH, there are no published background studies available for comparison. Dr. Kaltofen does, however, oddly refer to a published study for one of the six custom-SVOCs—phenol—in 536 *stream bed sediments* across the U.S.,⁵⁶ which bears no relevance to soils in general, and certainly not Crosby area soils.

We addressed the shortcomings of Dr. Kaltofen’s small custom-SVOC dataset (Appendix B) in our original (2018) report,⁵⁷ including:

- The questionable reliability of the custom-SVOC concentration data owing to their analysis using a non-standard laboratory method, which in some instances occurred after U.S. EPA holding times were exceeded and which were only available in “draft” reports from the laboratory;⁵⁸
- The lack of representativeness owing to the limited number of soil samples from the proposed Class Area analyzed for these custom-SVOCs (22), with most samples (18 of 22) collected 11 months after the Arkema events;
- The collection of only one background soil sample outside the proposed Class Area (also collected 11 months after the Arkema events), which also contained custom-SVOCs, raises the question, “*just how custom are these chemicals if they occur in background soil?*”; and
- Our literature review showed these “custom” SVOCs are not unique to the decomposition of organic peroxides and are formed by combustion of many forms of organic matter in the environment.⁵⁹

In summation, in the absence of any new and relevant information contained in Dr. Kaltofen’s supplement (2021) report, we stand by our original (2018) report’s opinions regarding custom-SVOC data collected by plaintiffs’ experts, including:

The so-called custom-SVOC data are of limited forensic utility. These data still do not support Dr. Kaltofen’s claim that soils within the proposed Class Area were impacted by these chemicals from the Arkema events.

Section 2.4: Cyanides

Again, as with the PAHs and custom-SVOCs, Dr. Kaltofen’s supplemental report inexplicably introduces cyanides despite the fact that Ms. Thompson, the expert put forward by plaintiffs to opine on the results of human health risk-based screening level assessment and identification of Constituents of Potential Concern (COPCs), concluded that cyanides were not Constituents of

⁵⁵ Stout, S.A. et al. (2018), Opinion 1g, p. 26; Opinion 1h, p. 27; Opinion 4b, p. 53.

⁵⁶ Lopes T.J. and Furlong, E.T. (2001). Occurrence and potential adverse effects of semi-volatile organic compounds in streambed sediment, United States, 1992–1995. *Environ Sci Technol* 20:727-737.

⁵⁷ Stout, S.A. et al (2018), p. 51-55.

⁵⁸ The unreliability of the “custom-SVOC” data was also recognized and described in *the* Expert Report of Dana H. Hebert (October 5, 2018).

⁵⁹ Stout, S.A. et al. (2018), p. 7, Table 4 (p. 68-69)



Potential Concern (COPC) in the ash, assorted solids (e.g., grass, etc.), soil, or indoor dust samples from the proposed Class Area.⁶⁰

Nonetheless, Dr. Kaltofen's supplemental report includes, for the first time, his basis for alleging the Arkema events increased cyanides concentrations in soils within the proposed Class Area. His principal basis for this is the detection of cyanides in the three ash samples – and the presumption that ash was dispersed and deposited throughout the proposed Class Area due to the Arkema events.

Dr. Kaltofen's and our own assessment of cyanides in soils is hampered by the overall lack of background concentration data in the published literature. Dr. Kaltofen's sole published reference in his supplemental report is to ATSDR (2006) that reported the topsoil from 51 hazardous waste sites had a median cyanide concentration of 0.4 ppm.⁶¹ (This indicates that half the samples contained less than 0.4 ppm and half contained more than 0.4 ppm.) The appropriateness of his comparison of soils from known *hazardous waste* sites to Crosby area soils is unclear, but nonetheless the median for the 48 soil samples from the proposed Class Area analyzed for cyanides was 60% lower (0.16 ppm).

Dr. Kaltofen does not refer to a 2005 U.S. Air Force study⁶² of cyanides of nearly 1200 background soil samples from California in this supplemental (2021) report, although he did so within his rebuttal (2018) report. Specifically, this large study reported 95% of the background soils contained < 0.7 ppm cyanide and 99% of the background soils contained < 3.0 ppm. Our literature search revealed only one other study where cyanide was measured: in 29 background soils in Michigan.⁶³ This study showed background soils contained cyanide concentrations ranging from non-detect (<0.005 ppm) to 1.2 ppm with a weighted mean of 0.18 ppm. Finally, and of limited value but specific for the Crosby area, plaintiffs' experts collected only one soil from outside the proposed Class Area that was analyzed for cyanides (AF-1, > 11 miles from Arkema). It contained 0.4 ppm total cyanides.

Figure 4 shows the concentration of total cyanides measured in 48 surface soil samples collected by plaintiffs' experts within the proposed Class Area (Appendix B).

Several statistics relevant to the available soil background studies' results are evident, including:

- 94% of the soil samples (45 of 48) contained LESS total cyanides than the lone background soil from Texas collected > 11 miles away by plaintiffs' experts (<0.4 ppm);
- 96% of the soil samples (46 of 48) contained LESS total cyanides than most background soils from the large California study (<0.7 ppm);

⁶⁰ Thompson, S. (2021), p. 3-8.

⁶¹ ATSDR (2006) Toxicological profile for cyanide. July 2006, p. 165.

⁶² Hunter, P.M. et al. (2005) Inorganic chemicals in ground water and soils: Background concentrations at California Air Force Bases. Proc. 44th Annual Mtg., Soc. Toxicol., New Orleans, March 2005; Accessed Aug. 20, 2021; https://dtsc.ca.gov/wp-content/uploads/sites/31/2018/01/Metals_Handout.pdf

⁶³ O'Hearn, M. and Lesler-Arnold, K.A. (1990). Background concentrations of metals and cyanide in lower Michigan soils. In: Proceed. 44th Industrial Waste Conf., Purdue Univ., 1989, Lewis Publ., Inc., Chelsea, MI, p. 33. Accessed Aug. 13, 2021: <https://books.google.com/books?hl=en&lr=&id=cPIKDwAAQBAJ&oi=fnd&pg=PA49&dq=Background+concentrations+of+metals+and+cyanide+in+lower+Michigan+soils&ots=HZ82XCHscl&sig=Xq9T0FAjFVwzRDqVT84rVm0G-bs#v=onepage&q=Background%20concentrations%20of%20metals%20and%20cyanide%20in%20lower%20Michigan%20soils&f=false>



- 100% of the soil samples (48 of 48) contained total cyanides LESS than the maximum that was found in Michigan and California background soils (<1.2 and 3.0 ppm, respectively); and
- The mean for all 48 soil samples (0.20 ppm) is practically identical to the mean for the Michigan background soils (0.18 ppm).

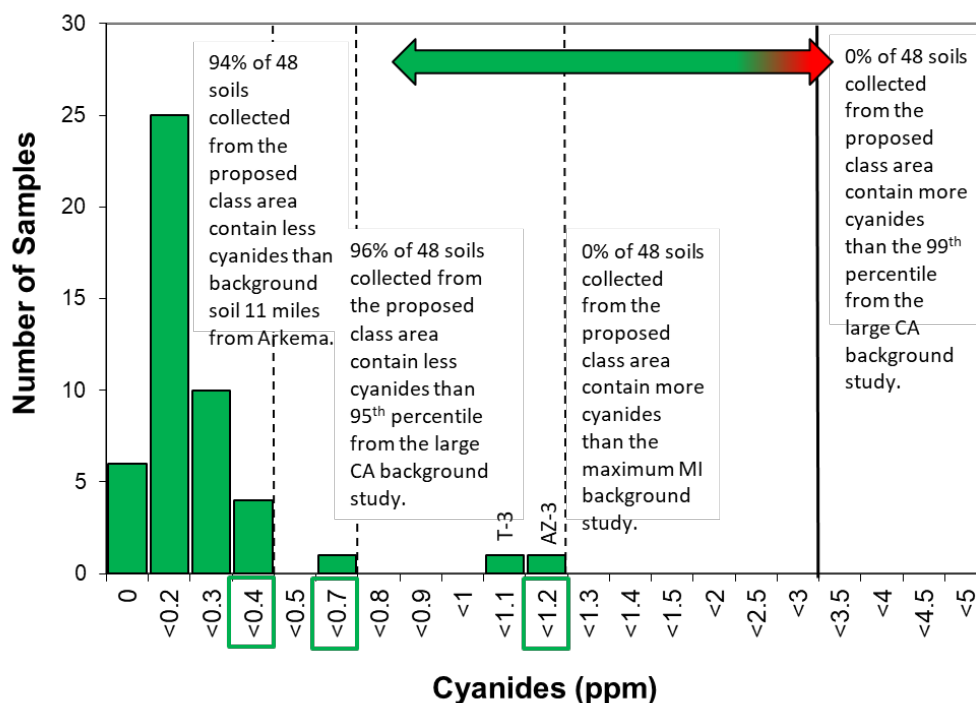


Figure 4: Histogram showing the concentration of total cyanides (ppm) for all 48 soil samples collected from the proposed Class Area and analyzed for total cyanides. Green bars depict samples within the ranges or below benchmarks reported in the only published studies known to us for cyanides in background soils (from California and Michigan). A single soil collected 11 miles from Arkema contained 0.4 ppm, as depicted. No samples from the proposed Class Area contained total cyanides above typical background.

Thus, the cyanides concentrations measured in soil samples collected by plaintiffs' experts provide no basis to conclude soils within the proposed Class Area contain cyanide in excess of background levels, let alone cyanides attributable to the deposition of ash from the Arkema events. These samples' locations are addressed in Section 3 and further demonstrate the cyanides concentration measured are not reasonably attributable to ash deposited from the Arkema events.

In summary, an unbiased assessment of the available data shows:

Dr. Kaltofen's new inference that soils within the proposed Class Area contain excess cyanides from the deposition of ash from the Arkema events has no scientific support.



Introduction to Sections 3 & 4

In addition to straight-forward and appropriate “apples-to-apples” comparisons of chemical concentrations *versus* defensible background benchmark concentrations, when assessing an alleged source of a chemical release, it also is critical to consider:

- The spatial distribution(s) of any alleged impacts relative to the presumed source, here, the Arkema facility, and
- The chemical pattern (fingerprints) of any alleged impacts *versus* the presumed source, here, ash and/or “black goo” particulates produced from the Arkema events *versus* other potential sources in the area.

Both steps also need to consider other potential sources of chemical in the area. Neither of these steps was pursued by Dr. Kaltofen in any rigorous manner, for which we criticized him and offered our own assessments in our original 2018 report. In light of Dr. Kaltofen’s emphasis on “new” background benchmark concentrations for Texas soils in his supplemental report, we present our re-assessment in these two additional steps in Sections 3 and 4.

Section 3: Spatial Distribution of Alleged Arkema-derived Chemicals

The spatial distribution of chemicals allegedly from the Arkema events have been modeled by plaintiffs’ expert, Dr. Auberle.^{64,65} Dr. Auberle prepared a cumulative particulate deposition map that shows where particulates from the Arkema events allegedly settled in the days following the Arkema events. Other plaintiff experts acknowledge and seemingly agree with Dr. Auberle’s results. For example, Mr. Glass states, “*As shown by the models of Dr. Auberle, particulates were deposited at varying rates onto the vegetation, structures, soils, and non-porous infrastructure (i.e. roof tops, road surfaces), where they would ultimately be washed by precipitation to nearby soils.*”⁶⁶ Dr. Kaltofen endorses this conceptual site model with statements such as, “*The release events scattered contaminated ashes throughout the Crosby, TX, area*”⁶⁷ and “*It is normal and scientifically-accepted that air emissions from the Arkema plant would tend to follow the winds at the time of release.*”⁶⁸ As stated by Dr. Auberle, the “[g]reatest impacts were nearest the Arkema facility.” Thus, if Arkema-derived particulates (ash or “black goo”) were the source of chemicals in the area’s soils, these chemicals’ concentrations should be highest within the areas of the greatest cumulative particulate deposition map.

Despite Dr. Auberle’s modeling work, however, Dr. Kaltofen did not evaluate the spatial distribution of the chemicals in his supplemental report using maps. Rather, he presents isolated statements that a sample was “X miles” or “Y miles” from the Arkema site, or makes sweeping statements such as:

⁶⁴ Auberle, W.M. (2021) Dispersion and Deposition of Particulate Matter from Explosions and Fires in August and September, 2017 at Arkema Plant, 18000 Crosby Eastgate Road, Crosby, Texas. EN3 Professionals, LLC, report dated July 14, 2021.

⁶⁵ Reporting Dr. Auberle’s results here should not be considered our endorsement of his methods or his conclusions. We understand that others will address the propriety of Dr. Auberle’s report.

⁶⁶ Glass, M. (2021) Supplemental Expert Report of Marc Glass. Downstream Strategies, report dated July 15, 2021; p. 19.

⁶⁷ Kaltofen, M. (2021), p. 9.

⁶⁸ Kaltofen, M. (2018), rebuttal report, p. 4.



“The highest values for benzo[a]pyrene, and thus the values the most exceed [sic] the expected background, are found in samples that were collected closest to the plant”.⁶⁹

Such statements are meaningless unless they consider all the plaintiffs’ samples and given Dr. Auberle’s modeling results, also the alleged deposition of particulates generated from the Arkema events.

We evaluated the spatial distribution of chemicals in soils in our original report using a variety of maps⁷⁰ and concluded:

There were no spatial trends in soil contaminant concentrations that suggested the contaminants were derived from the Arkema events, e.g., concentrations of contaminants were not higher closer to the Arkema facility, and

There was a high degree of variability in soil contaminant concentrations both between different properties and within single properties.⁷¹

We have again evaluated the spatial distributions with the added consideration of Dr. Kaltofen’s “new” background concentration references (Section 2) and Dr. Auberle’s cumulative particulate deposition map that we have reproduced in Figure 5. This map shows the directions, extent, and order of magnitude of particle mass deposited based on his transport/deposition modeling.

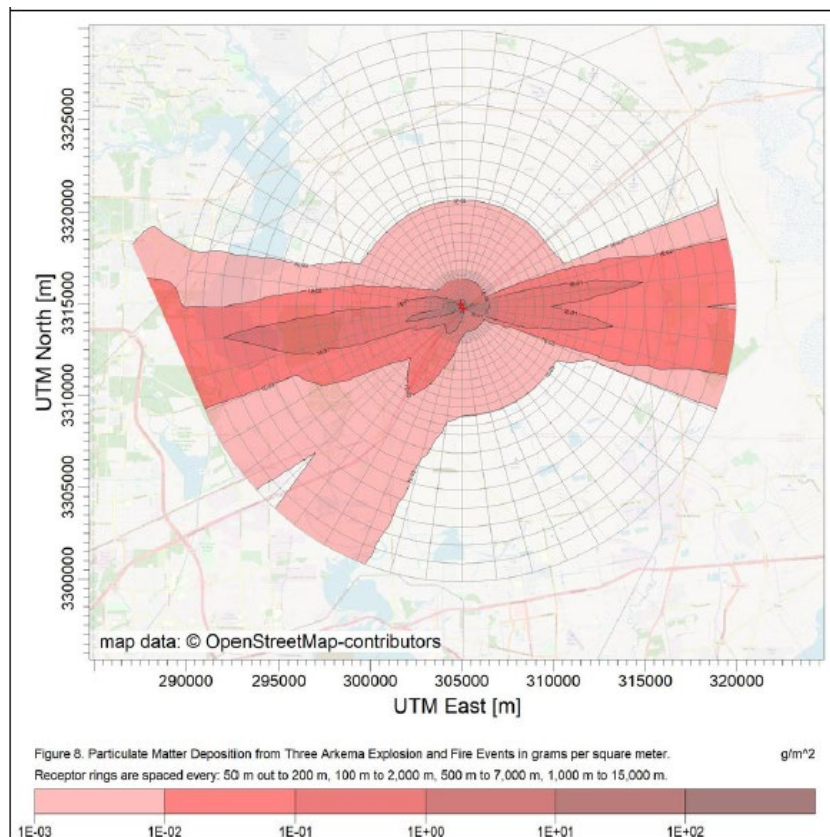


Figure 5: Dr. Auberle’s cumulative particulate deposition map showing deposition locations and rates (g/m²). Reproduced from Figure 8 in Auberle (2021).

⁶⁹ Kaltofen, M. (2021), p. 6.

⁷⁰ Stout, S.A. et al. (2018), Fig. 5A-D, p. 81-84.

⁷¹ Stout, S.A. et al. (2018), p. 25.



Dr. Auberle's results indicate that the depicted particulate deposition rates ranged by three orders of magnitude. Closest to the Arkema facility, particles were allegedly deposited at a rate of up to 1 gram per square meter (g/m^2 , see dark red) but only up to 0.001 g/m^2 further away (see lightest pink). This means that

- (1) Allegedly 1,000-times more particulates per unit area were deposited in the "dark red" area than were deposited in the "light pink" area,
- (2) If so, the chemical concentrations in soils should be markedly higher (allegedly 1,000-times higher per unit area) close to the Arkema facility than further away.

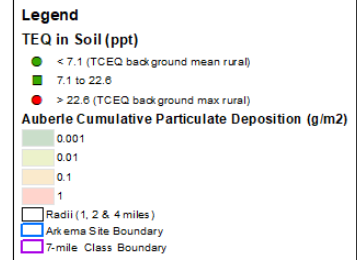
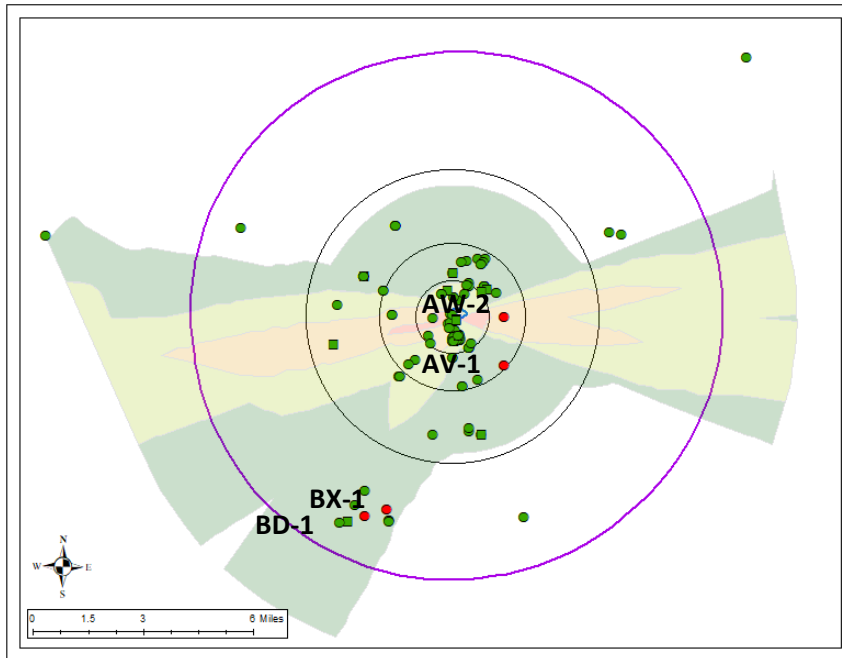
However, the data actually show something quite different.

Figures 6 to 8 depict the spatial distributions of dioxins, total PAHs, and total cyanides, respectively, in the ~120 soil samples collected by plaintiffs' experts.⁷² Each figure consists of three different views: (A) an aerial view of the entire 7-mile radius of the proposed Class Area, (B) an aerial view of the 2-mile radius closest to the Arkema Facility, and (C) a cross-plot of measured concentration *versus* distance (in miles) from the Arkema facility. Figures 6A-B, 7A-B, and 8A-B are superimposed on Dr. Auberle's cumulative particulate deposition map, although we changed the colors from those in Auberle's original for easier viewing.

Color-coding of the sample points on each figure reflects the concentrations of chemicals measured that are consistent with (green) or higher than (red) background benchmark concentrations discussed in Section 2 (and shown in Figures 1, 3, and 4).

⁷² We do not show the benzo[a]pyrene results alone, since they are virtually identical to the total PAH results.

A



B

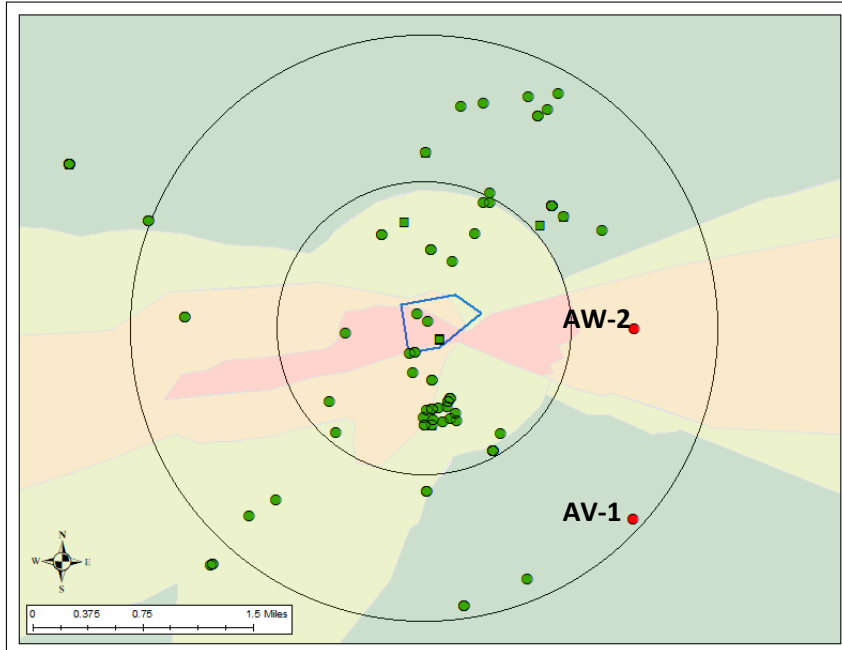


Figure 6A-B: Maps showing the concentration of dioxins (as TEQ ppt) for all soil samples collected by plaintiffs' experts and analyzed for dioxins superimposed on Dr. Auberle's cumulative particulate deposition map (from Fig. 5). Green sample points are below background concentrations as reported by TCEQ for rural soils in Texas, as referenced by Dr. Kaltofen. Red sample points depict the (four) samples (BD-1, AW-2, AV-1, and BX-1) containing TEQ concentrations above the TCEQ maximum (22.6 ppt). All TEQs are based upon WHO 2006 TEFs with all non-detects set to laboratory detection limit.

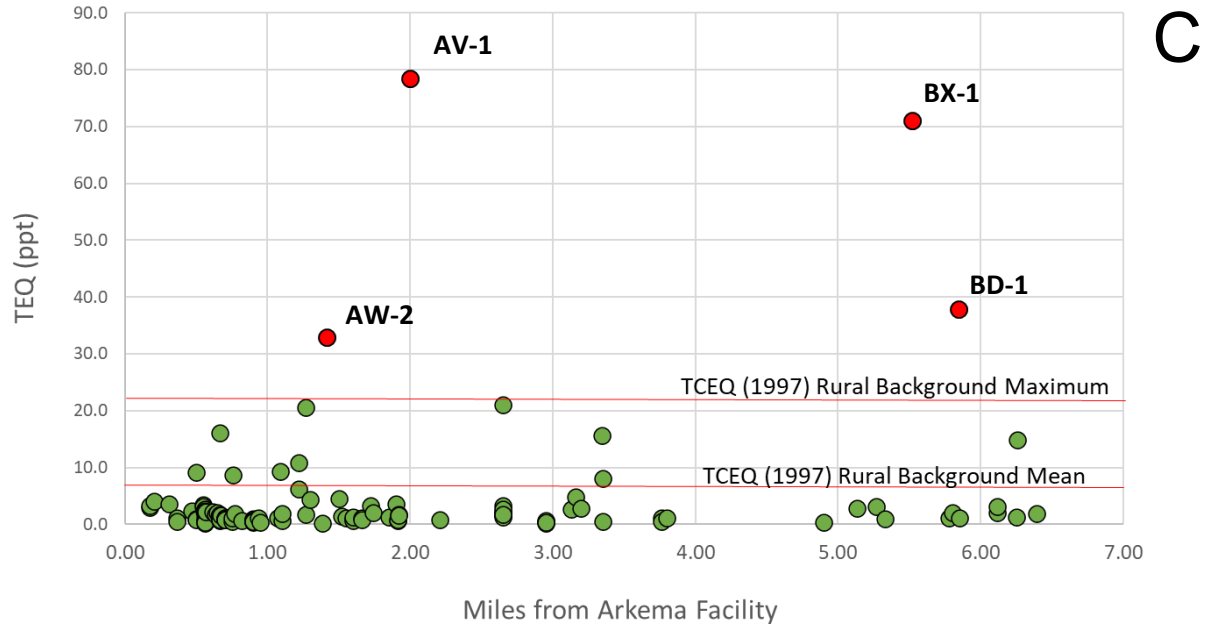


Figure 6C: Cross-plot showing the concentration of dioxins (as TEQ ppt, aka ppt) for all soil samples collected by plaintiffs' experts and analyzed for dioxins versus distance from the Arkema facility (miles). Green sample points are below background concentrations as reported by TCEQ for rural soils in Texas, as referenced by Dr. Kaltofen. Red sample points depict the (four) samples (BD-1, AW-2, AV-1, and BX-1) containing TEQ concentrations above the TCEQ maximum (22.6 ppt). All TEQs are based upon WHO 2006 TEFs with all non-detects set to laboratory detection limit.

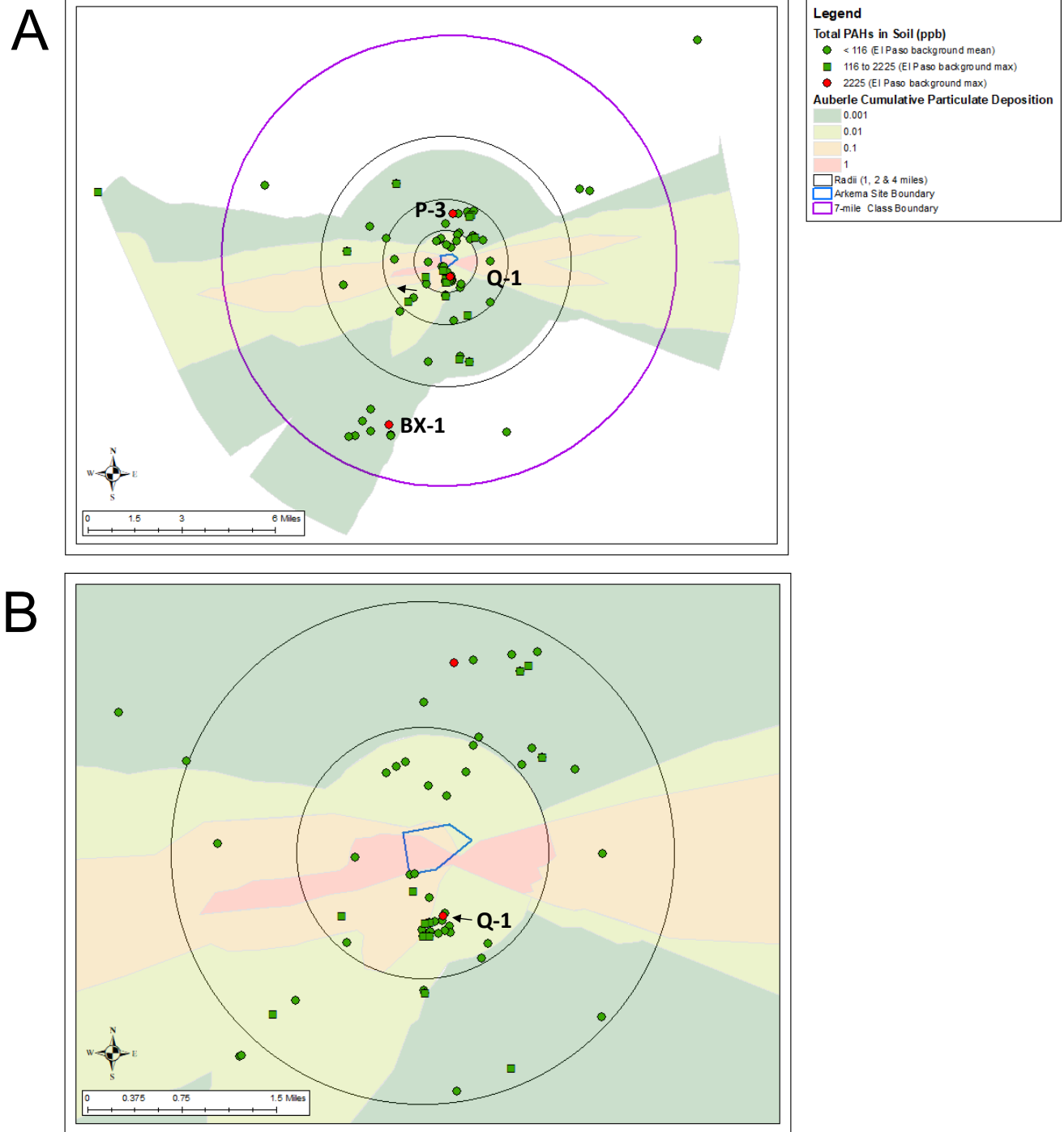


Figure 7A-B: Maps showing the concentration of total PAHs (ppb) for all soil samples collected by plaintiffs' experts and analyzed for PAHs superimposed on Dr. Auberle's cumulative particulate deposition map (from Fig. 5). Green sample points are below background concentrations as reported for background soils in El Paso, Texas, as referenced by Dr. Kaltfen. Red sample points depict the (three) samples (Q-1, P-3, and BX-1) containing PAH concentrations above the El Paso study's maximum (2225 ppb).

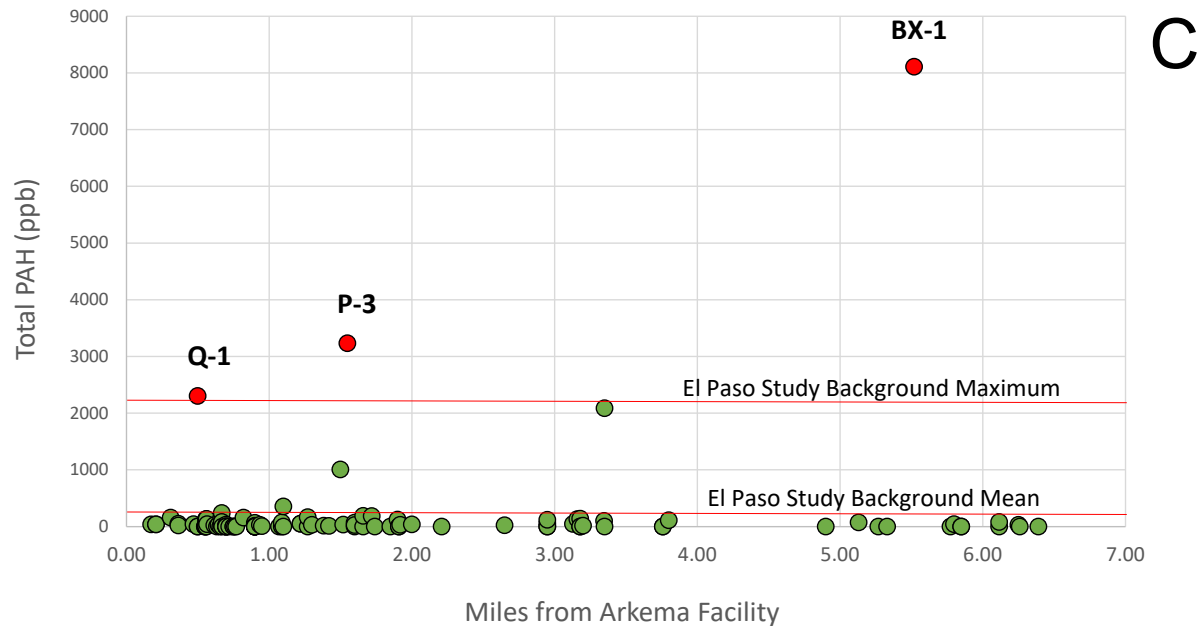


Figure 7C: Cross-plot showing the concentration of total PAHs (ppb) for all soil samples collected by plaintiffs' experts and analyzed for PAHs versus distance from the Arkema facility (miles). Green sample points are below background concentrations as reported for background soils in El Paso, Texas, as referenced by Dr. Kaltofen. Red sample points depict the (three) samples (Q-1, P-3, and BX-1) containing PAH concentrations above the El Paso study's maximum (2225 ppb).

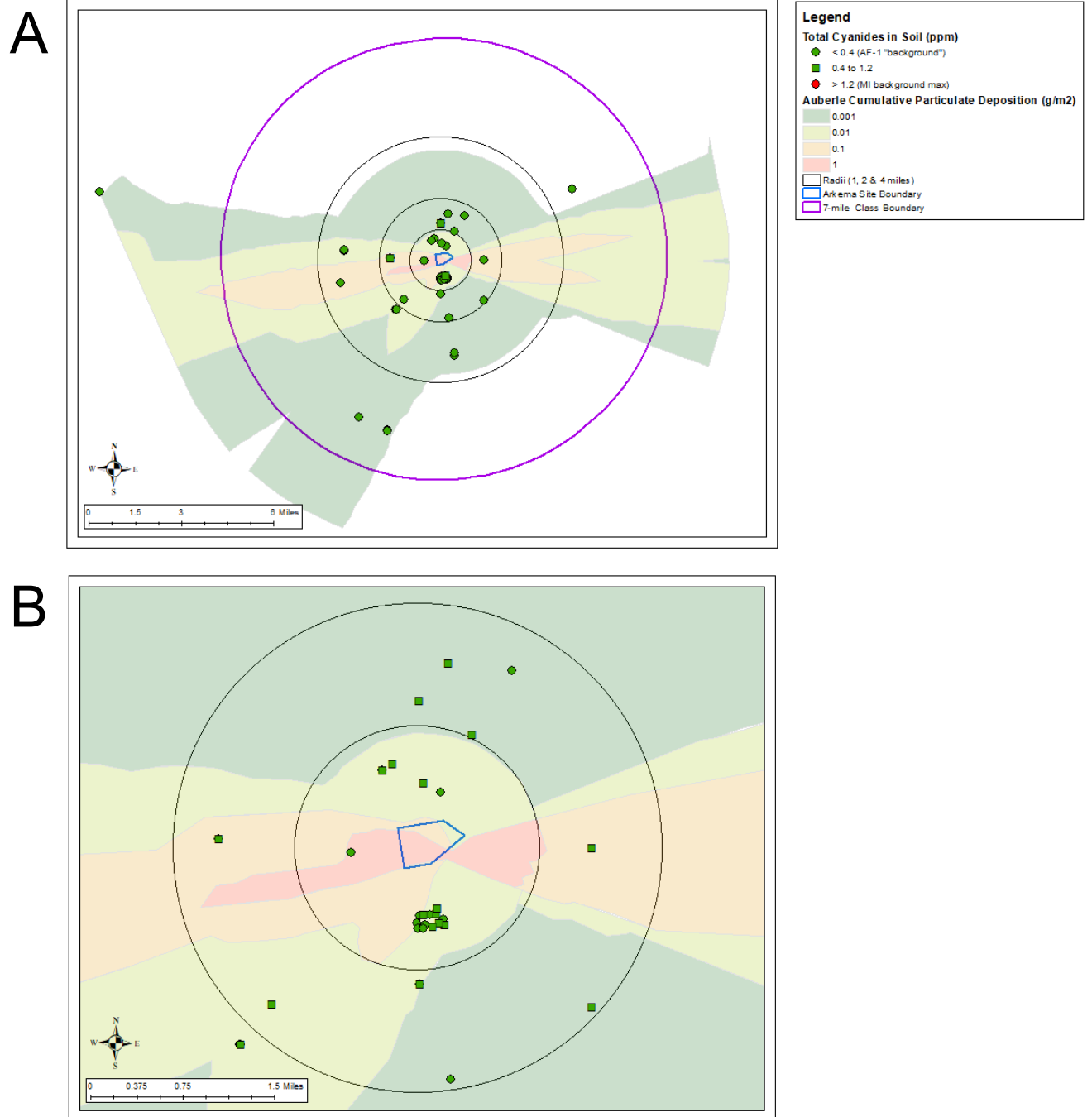


Figure 8A-B: Maps showing the concentration of total cyanides (ppm) for all soil samples collected by plaintiffs' experts and analyzed for total cyanides superimposed on Dr. Auberle's cumulative particulate deposition map (from Fig. 5). Green sample points are below background concentrations as reported in the only published studies known to us for cyanides in background soils (from California and Michigan). No samples exceed these background ranges; i.e., thus, no red sample points.

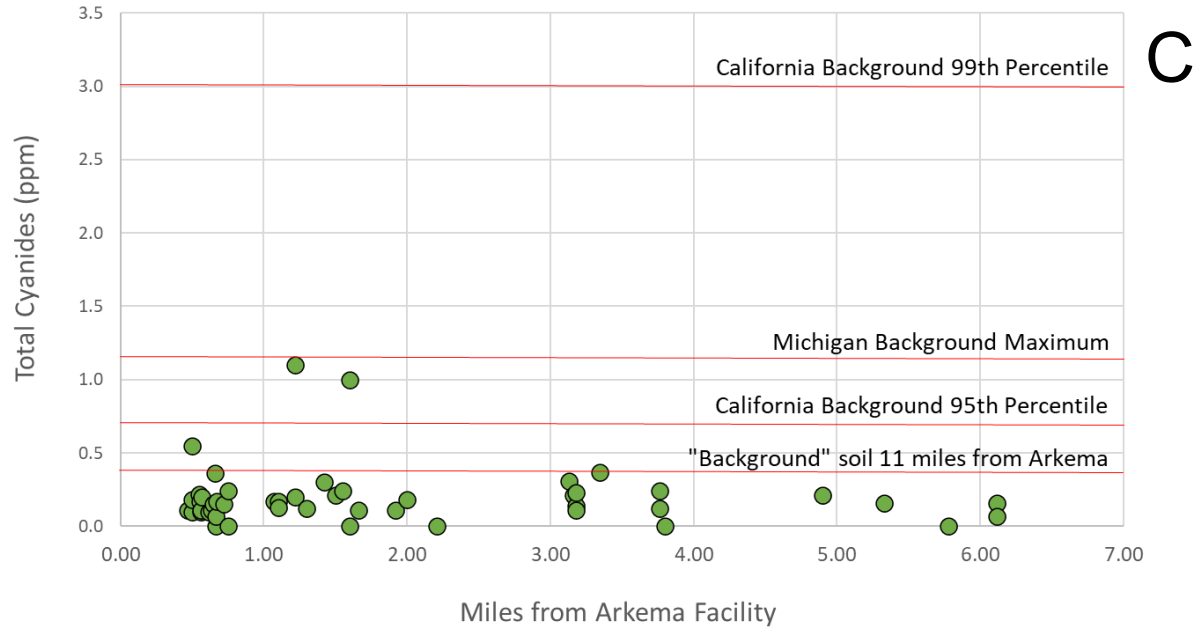


Figure 8C: Cross-plot showing the concentration of total cyanides (ppm) for all soil samples collected by plaintiffs' experts and analyzed for total cyanides versus distance from the Arkema facility (miles). Green sample points are below background concentrations as reported in the only published studies known to us for cyanides in background soils (from California and Michigan). No samples exceed these background ranges; i.e., thus, no red sample points.



The spatial distributions of dioxin concentrations in soils (Fig. 6), total PAH concentrations in soils (Fig. 7), and total cyanides concentrations in soils (Fig. 8) reveal:

- Nearly all soil samples collected either close to the Arkema facility or within Dr. Auberle's area of highest particulate deposition contain concentrations of contaminants within the range of Texas background concentrations.
- Only a few soil samples (0 to 4) within the proposed Class Area contain contaminants that could be considered anomalously high compared to background concentrations (as was concluded in Section 2).
- The locations of these few anomalously high(er) soil samples are not preferentially located either close(r) to the Arkema facility, nor within Dr. Auberle's areas of highest particulate deposition. In fact, some are located in areas predicted to have received 1,000-times less particulates per unit area than other areas, thus indicating these few soils' likely proximity to a local, perhaps property-specific source(s).
- Finally, only some of the samples that contain anomalously high concentrations of one contaminant (e.g., dioxins) also contain anomalously high concentrations of another contaminant. Specifically, BX-1 is the only sample that contains both high dioxins and high PAHs, yet it was collected 5.5 miles from Arkema in an area predicted to have received 1,000-times less particulates per unit area than soils close to Arkema (Fig. 6 and 7).
 - This last fact was addressed in our original (2018) report, where we showed no-to-poor correlations between dioxin and PAH (and custom-SVOC) concentrations in soils from the proposed Class Area.⁷³ This lack of correlation indicates the source(s) of the dioxins and PAHs (or custom-SVOCs) cannot be attributed to a single source, e.g., Arkema-derived particulates, but rather to varying sources, some of which are enriched in dioxins and others in PAHs.

Thus, the data show there is no pattern(s) to the spatial distribution of contaminants in soils within the proposed Class Area (Figs. 6 to 8) that would support the plaintiffs' conceptual site model that contaminant-laden particulates were "*scattered contaminated ashes throughout the Crosby, TX, area*" in a manner that "*would tend to follow the winds at the time of release*" resulting in "*Greatest impacts were nearest the Arkema facility.*" Instead, the data collected by plaintiffs' experts show:

The spatial distribution of contaminants in soils throughout the proposed Class Area bears no spatial relationship to the Arkema facility or to Dr. Auberle's cumulative particulate deposition map.

Rather, and as we had concluded in our original (2018) report, those few soil samples within the proposed Class Area that contain anomalously high(er) concentrations of dioxins, PAHs, custom-SVOCs, marker metals, or cyanides are just that – anomalous. The source(s) of these chemicals at discrete locations, that only in one instance co-occur at a given location (BX-1, 5.5 miles from the Arkema facility), cannot be reasonably attributed to the Arkema events, but must instead be caused by multiple and local, perhaps property-specific source(s) unrelated to the Arkema events.

⁷³ Stout, S.A. et al. (2018), Opinion 1c, p. 17, Fig. 3. We concluded: The lack of correlations between the concentrations of these contaminants in the soils from the proposed Class Area is clear evidence that these groups of chemicals do not have a common source, viz., microscopic "*ash*" or "*ash-like residues*" deposited on these soils, as alleged by Dr. Kaltofen.



Section 4: Chemical Fingerprints of Alleged Arkema-derived Chemicals

As summarized later in Section 6, the plaintiffs' experts' conceptual site model (CSM) is that particulates (ash and/or "black goo") from the Arkema events were deposited across the proposed Class Area. As we concluded above, however, the plaintiffs' experts' CSM is not supported by the data because:

- The measured concentrations of dioxins, PAHs (including benzo[a]pyrene), and cyanides in all but a few of the ~120 soil samples from the proposed Class Area are below typical background concentrations (Section 2; Figs. 1-4) and
- There is no spatial relationship between the measured concentrations of dioxins, PAHs, or cyanides relative to the Arkema facility or Dr. Auberle's cumulative particulate deposition maps (Section 3; Figs. 6-8).

In this section, we further evaluate the plaintiffs' experts' CSM by considering the chemical fingerprints of the allegedly impacted soils and other media within the proposed Class Area. In the following two sections, we focus on dioxins and PAHs, respectively, since both these chemical groups consist of many different individual chemicals, the relative distribution of which provides a "fingerprint" that allows for comparison between allegedly impacted samples from the proposed Class Area and the alleged Arkema sources – or alternative sources.

Section 4.1: Dioxin Fingerprints

The distribution of dioxin congeners and dioxin homologue groups (i.e., the sum of dioxin isomers of the same level of chlorination)⁷⁴ provide a means to evaluate chemical fingerprints among field samples, between field samples and suspect sources, or between field samples and benchmark references.⁷⁵

In our original (2018) report we addressed the chemical fingerprints of dioxin congeners found in plaintiffs' samples.⁷⁶ We showed numerous examples of how the dioxin chemical fingerprints of plaintiffs' samples were consistent with published fingerprints for rural and urban background soils and atmospheric dust, as well as from other types of sources relevant to plaintiffs' claims, including vacuum cleaner bag dust and U.S. household carpet dust. We also showed that the dioxin fingerprints of plaintiffs' samples were consistent with those for common ambient environmental sources of dioxin including forest fires, wood ash, and diesel and gasoline engine exhaust.⁷⁷ Based on that analysis, we opined that:

The dioxin patterns recognized in environmental samples collected by Dr. Kaltofen are consistent with many sources of dioxins, including ambient, background dioxins in U.S. soil and air.⁷⁸

⁷⁴ Homologues are the groups of PCDDs and PCDFs grouped by the number of chlorines on the molecules. TCDD: tetrachlorodibenzo-p-dioxins; PeCDD: penta chlorodibenzo-p-dioxins; HxCDD: hexa chlorodibenzo-p-dioxins; HpCDD: hepta chlorodibenzo-p-dioxins; OCDD: octa chlorodibenzo-p-dioxin; TCDF: tetrachlorodibenzofuran; PeCDF: pentachlorodibenzofuran; HxCDF: hexachlorodibenzofuran; HpCDF: heptachlorodibenzofuran; OCDF: octachlorodibenzofuran.

⁷⁵ Shields, W.J. et al. (2006) Dioxins and furans. In: R.D. Morrison and B.L. Murphy, eds., Environmental Forensics, Contaminant Specific Guide, Ch. 14, Elsevier, Boston, MA.

⁷⁶ Stout, S.A. et al. (2018), Opinion 2a, p. 29-32 and Figs. 6-8.

⁷⁷ See Figures 7 and 8 in NewFields original expert report for these comparative PCDD/F fingerprints.

⁷⁸ Stout, S.A. et al. (2018), Opinion 2a, p. 28.



New Statements by Dr. Kaltofen regarding Dioxin Composition and Fingerprints

On page 7 of Dr. Kaltofen's supplemental report, he makes reference to an Agency for Toxic Substances and Disease Registry (ATSDR) report from 1998, wherein ATSDR cites various statistics about the occurrence and relative distribution of dioxin congeners and dioxin homologues groups observed in certain urban and rural background soil samples.⁷⁹ While Dr. Kaltofen does not offer any rigorous analysis of these features compared to the proposed Class Area soils, he implies that the dioxin compositional features found in the proposed Class Area soils are distinct from those found in rural and urban background soils. Among the features he asserts indicate differences between proposed Class Area soils and 'typical' rural and urban background soils is the relative distribution of dioxin homologues and relative distribution of dioxin isomers. As explained in the following paragraphs, however, the definitive literature regarding dioxin chemical fingerprints proves Dr. Kaltofen's assertions are unequivocally wrong.

The authoritative scientific compendium regarding the environmental occurrence and behavior of dioxins was published by EPA in 2003.⁸⁰ This comprehensive document is the most complete inventory of dioxins in environmental media and includes a summary of dioxins found in 354 rural and 270 urban soils. It includes the studies referenced in the 1998 ATSDR report that Dr. Kaltofen refers to,⁶⁹ as well as data from numerous other national studies that EPA used to inventory concentrations and chemical fingerprints of dioxins in rural and urban soils.⁸¹

In its 2003 study, EPA inventoried the general chemical fingerprints of dioxins of rural and urban soil at both the congener and homologue group level. In our original 2018 expert report, we favorably compared dioxin congener fingerprints between the average proposed Class Area soils and EPA's rural and urban soil references using normalized histograms.⁸²

We have again evaluated and further compared these chemical fingerprints of dioxin homologue groups for the average proposed Class Area soils and EPA's rural and urban soils. There is variability in dioxin composition among the 122 proposed Class Area soil samples analyzed for dioxins, in part because of detection limit constraints, but also because there is inherent variability in background samples because they are influenced by different proportions of household, local, and regional sources. However, and analogous to EPA's approach for compiling data for hundreds of U.S. rural and urban background soils, the average dioxin concentrations/patterns fairly represent the overall character of the dioxins in soils from the proposed Class Area.⁸³

The average percentages of each dioxin homologue group for rural and urban soils reported by EPA (2003), compared to the average of all soil samples within the proposed Class Area, are listed in Table 4.

⁷⁹ ATSDR (1998) Toxicological profile for chlorinated dibenzo-p-dioxins. Public Health Service, Agency for Toxic Substances and Disease Registry, Atlanta GA.

⁸⁰ EPA. (2003). Exposure and human health reassessment of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and related compounds. Publ. EPA/600/P-00/001. Office of Research and Development, Washington, DC.

⁸¹ We reviewed the EPA's background concentration results in our original (2018) report.

⁸² Stout, S.A. et al. (2018), Fig. 8A-C, p. 87.

⁸³ Any differences between the average characteristics and those of a singular sample would need to be studied and explained by plaintiffs' experts before assigning any contribution of dioxin to such samples to the alleged Arkema source materials, viz., ash and "black goo."



Table 4. Comparison of percentage of dioxin homologue groups between the proposed Class Area soil samples' average and EPA's rural soil and urban soil averages.

Dioxin Homologue Group	Proposed Class Area Soil (Avg %)	EPA Rural Soil (Avg %)	EPA Urban Soil (Avg %)
TCDD	0.04	0.31	1.2
PeCDD	0.1	0.57	0.74
HxCDD	1.1	3	1.3
HpCDD	11	14	6.8
OCDD	84	68	83
TCDF	0.2	1.1	1.4
PeCDF	0.1	1.5	1.4
HxCDF	0.4	2.7	0.9
HpCDF	1.4	4.6	1.6
OCDF	1.6	4.1	1.4

Our evaluation shows that the distribution of dioxin homologues measured in the average proposed Class Area soil samples is highly correlated with EPA's average rural ($r^2=0.9940$) and urban soils ($r^2=0.9971$). In all three soil groups, the assemblages are dominated by similar percentages of the highly chlorinated OCDD and HpCDD, with lesser amounts of lower chlorinated dioxins and furans. **There is nothing atypical in the pattern of dioxin homologues observed in the average proposed Class Area soil samples compared to EPA's rural and urban soil standards.**

In contrast, the distribution of dioxin homologues measured in plaintiffs' experts' alleged Arkema source materials – ash and “black goo” – collected in the proposed Class Area are significantly different from the average proposed Class Area soil samples (Table 5).⁸⁴

⁸⁴ In Table 5, non-detects are assigned a value of zero to facilitate comparison of the homologue group patterns.



Table 5. Comparison of percentage of dioxin homologue groups between proposed Class Area soil samples and the alleged Arkema source of dioxins to the Class Area - ash and “black goo.”

Dioxin Homologue Group	Proposed Class Area Soil (Avg %)	Ash E-1 (%)	Ash F-1 (%)	Ash CE-1 (%)	Ash T-1 (%)	Ash U-1 (%)	“Black Goo” AO-1 (%)	“Black Goo” CG-1 (%)
TCDD	0.04	0	0	0.0	89.6	0.0	0.0	0.0
PeCDD	0.1	0	0	0.0	4.8	0.5	0.0	0.0
HxCDD	1.1	0	0	1.3	0.0	8.4	1.0	0.0
HpCDD	11	0	0	17	0.0	21	17	38
OCDD	84	0	0	59	5.7	50	74	62
TCDF	0.2	0	0	9.9	0.0	1.3	0.0	0.0
PeCDF	0.1	0	0	5.3	0.0	17	0.2	0.0
HxCDF	0.4	0	0	1.5	0.0	0.8	0.6	0.0
HpCDF	1.4	0	0	5.6	0.0	0.6	3.5	0.0
OCDF	1.6	0	0	0.0	0.0	0.4	4.2	0.0

Table 5 shows there are notable differences in the distribution of dioxin homologues between the average proposed Class Area soil samples and the “pure” ash samples collected by plaintiffs’ experts. These differences include:

- Two of the five plaintiffs’ experts’ ash samples (E-1 and F-1) contained no measurable dioxin homologues at all;
- Unlike the average proposed Class Area soil samples, the CE-1 ash contained no detectable TCDD, PeCDD, or OCDF homologues, and significantly higher relative amounts of furans, notably TCDF, PeCDF, HxCDF and HpCDF, than the average proposed Class Area soil samples; and
- The T-1 ash sample was composed of almost 90% TCDD homologues, and unlike the proposed Class Area soil samples, contained no HxCDD, HpCDD, TCDF, PeCDF, HxCDF, HpCDF or OCDF.

Significant difference in dioxin homologue distributions between the average proposed Class Area soil samples and the “black goo” samples collected by plaintiffs’ experts are also evident in Table 5. These differences include:

- Unlike the proposed Class Area soil samples, “black goo” sample AO-1 contained no measurable TCDD, PeCDD, and TCDF, and higher relative amounts of HpCDD and OCDF; and
- Unlike the proposed Class Area soil samples, “black goo” sample CG-1 contained no measurable TCDD, PeCDD, HxCDD, TCDF, PeCDF, HxCDF, HpCDF or OCDF, and higher relative amounts of HpCDD.

Note that “black goo” sample CG-1 is specifically called out on page 8 of Dr. Kaltofen’s supplemental report as a sample that:

“...had 31 ppt of 2,3,7,8-TCDD, well above the highest reported background value of non-detect (<2.9 ppt to 11.2 ppt)...”



Not only did “black goo” sample CG-1 contain no measurable 2,3,7,8-TCDD (Dr. Kaltofen’s alleged 31 ppt is a substituted detection limit, not an authentic measurement), it is clear from Table 5 that the dioxin homologue pattern for “black goo” sample CG-1 bears no resemblance to the dioxin homologue pattern for the average proposed Class Area soil samples. Thus, “black goo” sample CG-1 does not represent a source material that could give rise to the dioxin patterns observed in proposed Class Area soil samples.

In summary, the dioxin homologue patterns observed in plaintiffs’ experts’ alleged source materials – ash and “black goo” – were highly variable among themselves and did not resemble the dioxin homologue patterns observed in the average proposed Class Area soil samples. Some of the samples (Ash E-1 and F-1) had no measurable dioxin homologues at all. These observations lead us to concluded that:

The dioxin homologue patterns observed among plaintiffs’ experts’ alleged Arkema source materials – ash and “black goo” – vary significantly among themselves, and do not reconcile with the homologue patterns observed in proposed Class Area soils.

The “pure” ash and “black goo” contain either no dioxin homologues or contain homologues that cannot be reasonably considered as sources to the dioxins measured in the proposed Class Area soil samples.

Section 4.2: PAH Fingerprints

There can be significant variability among the chemical fingerprints of typical PAH sources, which allows for comparisons between the allegedly impacted samples *versus* alleged Arkema sources, i.e., ash and “black goo.”

Plaintiffs’ experts measured PAHs in four ash samples and four “black goo” samples and found detectable PAHs in seven of the eight, as inventoried Table 6. The concentrations of total PAHs present in these seven alleged source materials ranged from 22.8 to 1,378 ppb. Notably, the three soil samples that contained anomalously high(er) concentrations of total PAHs (Q-1, P-3, and BX-1; 2,300, 3,230, and 8,108 ppb, respectively; Section 2.2; Fig. 3) contain nearly two- to six-times more PAHs than the highest of the alleged source materials (1378 ppb). This creates a “mass balance issue,” wherein the available data shows:

The “pure” alleged Arkema source materials (ash and “black goo”) contain LESS PAHs than the soils that they allegedly impacted. Therefore, it is impossible to conclude these soils’ elevated PAHs are due to alleged Arkema source materials.



Table 6: Concentrations of total PAHs and benzo[a]pyrene measured in alleged Arkema source materials (ash and “black goo”).

Sample ID	Matrix	Distance from Arkema (mi)	Total PAH (ppb)	Benzo[a]pyrene (ppb)
DD-3	Ash	On-site	295	6.98
DD-4*	"black goo"	On-Site	1,378	23.2
CG-1	"black goo"	0.36	982	nd
AO-1*	"black goo"	0.55	nd	nd
F-1	Ash	1.6	909	nd
E-1	Ash	2.5	567	nd
B-1	Ash	3.2	22.8	nd
B-2*	"black goo"	3.2	139	13.7

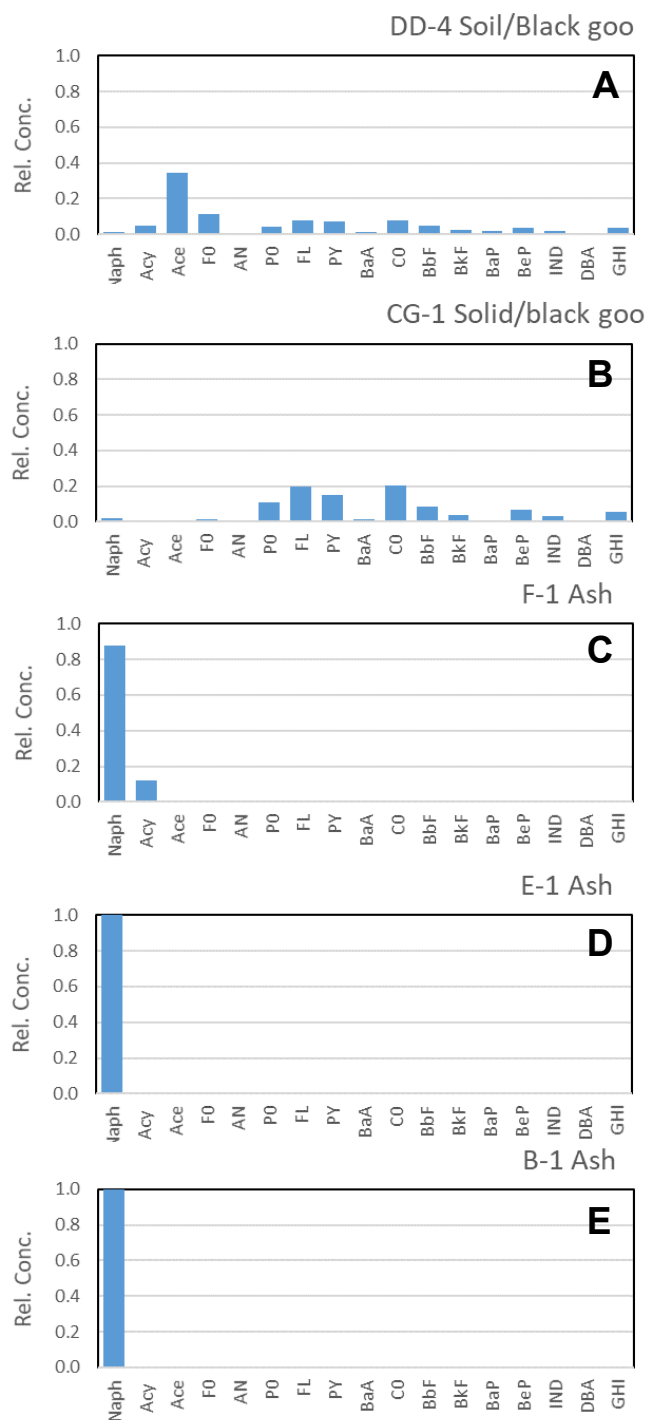
*mixture of soil and "black goo" per Glass (2018)

The chemical fingerprints for five of the alleged Arkema source samples are shown in Figure 9 (left panel). Each of these fingerprints depicts the normalized concentrations of 17 PAHs. Inspection shows the “black goo” contained a variety of individual PAHs in relatively low relative concentrations. Acenaphthene (Ace) predominated in the DD-4 soil/“black goo” sample (Fig. 9A) whereas fluoranthene (FL) and chrysene (C0) equally predominated in the CG-1 “black goo” (Fig. 9B). Each of the ash samples is overwhelmingly-to-exclusively dominated by naphthalene (N0; Fig. 9C-E).

As discussed in Section 2.2, plaintiffs’ experts measured PAHs in 116 soil samples, and only three of these contained total PAH concentrations exceeding the maximum concentration of PAHs measured in the El Paso soil background study (Q-1, P-3, and BX-1; Fig. 3). The spatial distribution of these three anomalous samples is unrelated to the Arkema facility or Dr. Aurbele’s particulate deposition map (Fig. 7A-B). In fact, the PAH concentrations of these three samples tended to increase with increased distance from the Arkema facility (Fig. 7C), which is completely inconsistent with plaintiffs’ CSM (Section 3.1). As noted earlier in this section, these three soil samples contain nearly 2- to 6-times more PAHs than the alleged source materials. These facts alone argue the PAHs in these anomalous samples are not reasonably attributable to the Arkema events.



Alleged Arkema Sources



Allegedly Impacted Samples

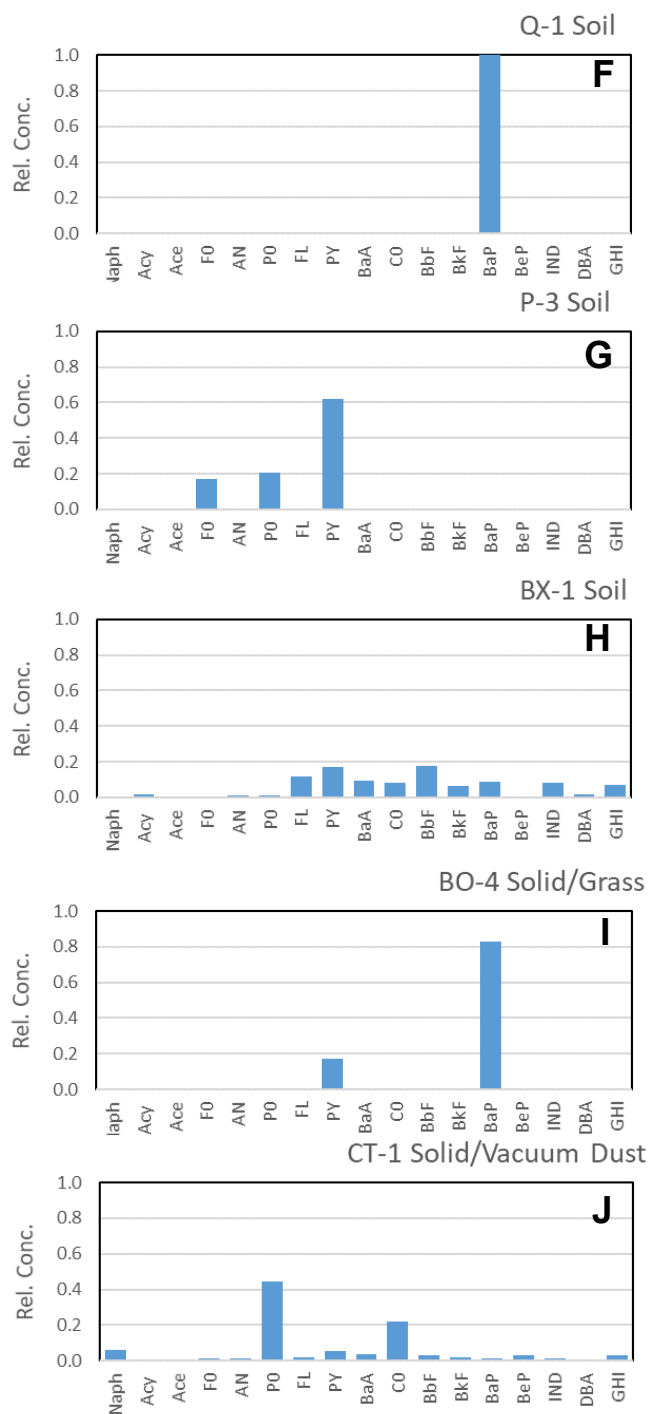


Figure 9: PAH histograms showing the normalized “fingerprints” of alleged Arkema sources (left) and allegedly impacted samples (right). See text for descriptions. Compound abbreviations: Naph: naphthalene; Acy: acenaphthylene; Ace: acenaphthene; F0: fluorene; AN: anthracene; P0: phenanthrene; FL: fluoranthene; PY: pyrene; BaA: benz[a]anthracene; C0: chrysene; BbF: benzo[b]fluoranthene; BkF: benzo[k]fluoranthene; BaP: benzo[a]pyrene; BeP: indeno[1,2,3-c,d]pyrene; DBA: dibenzo[a,h]anthracene; GHI: benzo[g,h,i]perylene.



The PAH fingerprints for these three anomalous samples are shown in Figure 9F-H. Inspection of these figures shows these three soil samples' fingerprints bear no semblance to the alleged Arkema source materials (Fig. 9A-E). Oddly, the Q-1 soil contained only one detectable PAH, benzo[a]pyrene (Fig. 9F). This very unusual fingerprint, which we discussed in our original (2018) report,⁸⁵ is similar to that observed in the BO-4 grass sample (Fig. 9I). These are the two samples that Dr. Kaltofen repeatedly calls out in his cursory assessments of the PAH data in his original, rebuttal and supplemental reports as evidence of Arkema impacts. However, the benzo[a]pyrene-dominated PAH fingerprints in the Q-1 soil and BO-4 grass samples (Fig. 9F and 9I) cannot be reasonably attributed to ash or "black goo," which have completely different PAH fingerprints (Fig. 9A-E). In fact, benzo[a]pyrene was not even detected or was virtually absent in these alleged Arkema source materials (Table 2).

The PAH fingerprints for the other anomalous soil samples (P-3 and BX-1; Fig. 9G-H) also bear no or little semblance to the alleged Arkema sources. The P-3 soil's fingerprint is dominated by only three PAHs, fluorene (F0), phenanthrene (P0), and pyrene (PY; Fig. 9G), none of which is relatively abundant in the alleged Arkema sources (Fig. 9A-E).

The BX-1 soil's PAH fingerprint bears some semblance to those of the "black goo". However, there are important details that indicate the "black goo" is not present in the BX-1 soil, which recall was collected 5.5 miles away from the Arkema facility (Fig. 7A). These details rely upon the well-established variability between PAH isomer ratios in different source materials, which are known to vary depending on the formation kinetics.^{86,87} More detailed inspection shows that the "black goo" samples exhibit FL/PY ratios >1, BaA/C0 ratios <1, and BaP/BeP ratios <1 (Fig. 9A-B), whereas the BX-1 soil sample exhibits the opposite: FL/PY ratio <1, BaA/C0 ratio >1, and BaP/BeP ratio >1 (Fig. 9H). This demonstrates the PAHs in the BX-1 soil cannot be derived from "black goo."

Figure 9J shows the PAH fingerprint for the CT-1 vacuum cleaner dust sample that has also been highlighted by Dr. Kaltofen. This sample is reportedly "*from a vacuum cleaner bag that had been used to clean ash fall from the affected home*".⁸⁸ We raised questions regarding the representativeness of this sample, which was collected 11 months after the Arkema events, in our original (2018) report.⁸⁹ We also discussed how the concentration of PAHs in the vacuum cleaner dust sample (CT-1) was less than is reported in published studies of typical household dust.⁹⁰ In Figure 9J, we show that the CT-1 vacuum cleaner dust's PAH fingerprint is completely different from that of the alleged Arkema ash samples (Fig. 9C-E). This difference further shows that the vacuum cleaner dust cannot be reasonably attributed to ash from the Arkema events.

Further comparisons of PAH fingerprints to other samples allegedly impacted by ash from the Arkema events, such as the 13 surface wipe samples, a drywall sample (N-1), and a paper yard sign (J-3) collected by plaintiffs' experts analyzed for PAHs cannot be done. The simple reason for this is that none of these samples contained any detectable PAHs.

⁸⁵ Stout, S.A. et al. (2018), Opinion 3a, p. 44.

⁸⁶ Dickhut, R.M. et al. (2000) Automotive sources of carcinogenic polycyclic aromatic hydrocarbons associated with particulate matter in the Chesapeake Bay region. Environ. Sci. Technol. 34(21): 4635-4640.

⁸⁷ Yunker, M.B. et al (2002) PAHs in the Fraser River Basin: A critical appraisal of PAH ratios as Indicators of PAH source and composition. Org. Geochem. 33: 489-515.

⁸⁸ Kaltofen, M. (2018), original report, p. 9.

⁸⁹ Stout, S.A. (2018), Opinion 2c, p. 37

⁹⁰ Stout, S.A. (2018), Opinion 3e, p. 50.



Thus, the plaintiffs' data provides no evidence that "*fallout of combustion products from Arkema onto plaintiffs' properties*" occurred, as Dr. Kaltofen claims.⁹¹ Instead, the plaintiffs' data show that:

The chemical fingerprints for PAHs in the only three soil samples containing PAHs in excess of El Paso soil background levels (Q-1, P-3, and BX-1), and in other anomalous samples allegedly containing PAHs from Arkema sources highlighted by Dr. Kaltofen (BO-4 grass and CT-1 vacuum cleaner dust), are completely different from the chemical fingerprints of the alleged Arkema sources, ash and "black goo."

These differences are clear and additional evidence that the PAHs in these allegedly impacted samples cannot be reasonably attributed to the alleged Arkema source.

The diverse PAH fingerprints in these allegedly impacted samples indicate they are likely derived from variable and local, possibly property-specific, PAH sources.

⁹¹ Kaltofen, M (2018), p. 16



Section 5: Alternative Sources in Crosby Area

Dioxins and PAHs are ubiquitous in the modern environment and arise from a variety of household, local, and regional sources relevant to the Crosby area. In our original (2018) report, we identified:

- Regional sources of dioxins and PAHs including vehicular traffic on Highway 90 and other roadways, active railways, other industrial/commercial facilities, the greater Houston airshed, prescribed burning, crop/field clearing, wildfires, and oil and gas production operations;⁹² and
- Local, property-specific sources, including structure or vehicle fires, residential burning of trash or yard/wood waste (“backyard burning”), pesticide/herbicide use, and commercial restaurants.⁹³

Considering these regional and property-specific sources in the Crosby area, certainly the mere detection of PAH and dioxins in environmental media does not indicate they are due to the Arkema events. Dr. Kaltofen’s original (2018) report failed to acknowledge the ubiquity of these alleged Arkema-derived chemicals or rule out the existence and impact of any alternate source(s) on the proposed Class Area.

In Dr. Kaltofen’s (2021) supplemental report, he acknowledges for the first-time alternative sources of “Arkema-related” contaminants and specifically identifies oil and gas operations, railroad traffic, roadway traffic, other accidents and fires, and other industrial emitters.⁹⁴ His supplemental report, however, only includes a limited discussion of oil and gas operations and potential impacts from KMCO, a nearby industrial facility, which he describes without support as “the major background source.”

Among the alternative sources identified in our original (2018) report, Dr. Kaltofen continues to ignore backyard burning, which is widely recognized as a major source of dioxins and a source of PAH to the environment. In fact, in 2000, the U.S. EPA recognized the backyard burning of residential trash and yard waste in burn barrels and burn piles as the largest source of dioxins in the U.S.⁹⁵ Backyard burning is known to occur within the proposed Class Area, where 10 residential burn events were observed within the Class Area between September 2-6, 2017 alone.⁹⁶ One of the former class representatives, Greg Nason, also acknowledged the practice of trash burning in the area.⁹⁷

Based upon Dr. Kaltofen’s limited comments regarding his two “major” alternative sources – oil and gas operations and the KMCO facility – offered in his supplemental report, we conclude that:

Dr. Kaltofen unsuccessfully attempts to rule out two alternative sources of PAHs and continues to ignore alternative sources of PAHs and other alleged Arkema-derived chemicals, including dioxins.

⁹² Stout et al. (2018), p. 10

⁹³ Stout et al. (2018), pp. 10-11

⁹⁴ Kaltofen, M. (2021), p. 11

⁹⁵ Stout et al. (2018), p. 13; citing, EPA (2006) An inventory of sources and environmental releases of dioxin-like compounds in the U.S. for the Years 1987, 1995, and 2000. Final report. National Center for Environmental Assessment, Washington, DC; EPA/600/P-03/002F.

⁹⁶ Stout et al. (2018), Exhibit 5

⁹⁷ Deposition of Greg Nason, August 2018, p. 228 lines 15-22.



In the following sections, we respond to Dr. Kaltofen's comments on the two alternative PAH sources he discusses, viz., the area's oil and gas operations and the KMCO facility.

Section 5.1: Assessment of Dr. Kaltofen's comments on oil and gas operations

Oil and gas wells are present throughout the proposed Class Area (Figure 10). As Dr. Kaltofen acknowledges, oil and gas operations can result in localized releases of hydrocarbons to surrounding soil. However, Dr. Kaltofen erroneously states that oil and gas operations do not result in releases to air that could spread within the Crosby area.⁹⁸

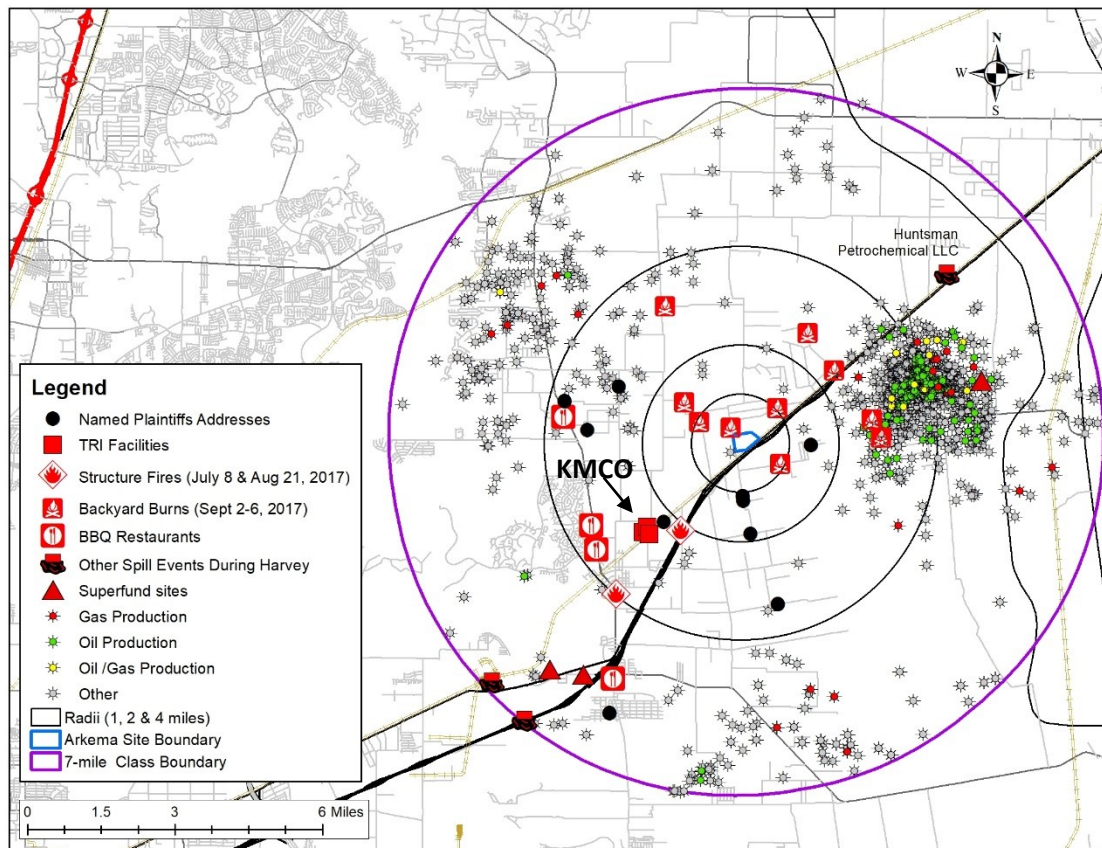


Figure 10. Map showing the 7-mile radius proposed Class Area and prospective alternate sources of contamination in the area. Major State and Federal highways are shown in black and red, respectively; railways shown in tan; producing wells and all other wells (Source: ERM, 2019: Oil and Gas Well Report, Harris Co., Texas, Aug. 6, 2018); other spill events during Hurricane Harvey obtained from U.S. Coast Guard National Response Center, <http://www.nrc.uscg.mil/>; backyard burns obtained from CTEH; Superfund Sites (French, LTD and Sikes Disposal Pits; red triangles) from TCEQ website. The four Industrial Facilities identified by Dr. Kaltofen using the TRI database are shown in red squares, including KMCO discussed in the text.

⁹⁸ Kaltofen, M. (2021), p. 13.



Published research, however, shows that air emissions from local oil and gas well operations do contribute to the regional pollution burden for both particulate matter and volatile organic compounds (VOCs).⁹⁹ Emissions can occur from surface operations, wells and pipelines, the operation of diesel or gas-powered equipment, and accidental releases. The primary air pollutants related to oil and gas activities include nitrogen oxides (NOx), particulate matter, benzene, toluene, ethylbenzene, hexane, and PAHs.¹⁰⁰ Benzo[a]pyrene, one of the chemicals Dr. Kaltofen focused on (Section 3.2), is a PAH. Thus, Dr. Kaltofen's comments regarding oil and gas operations are simply wrong and we conclude:

Oil and gas well operations do contribute to both localized and regional PAH loading.

Section 5.2: Assessment of Dr. Kaltofen's comments on industrial facilities – KMCO

Dr. Kaltofen conducted a search of the Toxic Release Inventory (TRI) database to identify industrial facilities located in Crosby, Texas that release or have released chemicals into the environment.

As background, the Emergency Planning and Community Right-to-Know Act (EPCRA) requires certain facilities¹⁰¹ that exceed reporting thresholds for contaminants on the TRI List to submit annual toxic chemical release forms. This information is maintained on a publicly available database called the TRI database. Dioxins¹⁰² and PAH¹⁰³ are present on the TRI List as chemical classes. Manufacturing, processing, or otherwise use (MPOU) thresholds exist for dioxin and PAH chemical classes. The MPOU threshold for dioxins is 0.1 gram and the MPOU threshold for PAH is 100 lbs.¹⁰⁴ A facility must exceed MPOU thresholds before it is required to report environmental releases (i.e., fugitive emissions, stack emissions, and/or discharges to receiving streams and water bodies) to the TRI database. Therefore, the TRI database is at best partial in

⁹⁹ U.S. EPA (2017) 2017 National Emissions Inventory: January 2021 Updated Release, Technical Support Document. <https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data>

¹⁰⁰ Los Angeles County Department of Public Health (2018). Public Health and Safety Risks of Oil and Gas Facilities in Los Angeles County.

¹⁰¹ The facility has 10 or more employees, the facility's primary NAICS code is included on the TRI list or it is a federal facility, the facility manufactures, processes, or otherwise uses TRI-listed chemicals, and the facility exceeds any of the thresholds for a chemical or a chemical category. <https://www.epa.gov/toxics-release-inventory-tri-program/basics-tri-reporting>.

¹⁰² 2,3,7,8-Tetrachlorodibenzo-p-dioxin, 1,2,3,7,8-Pentachlorodibenzo-p-dioxin, 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin, 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin, 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin, 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin, 2,3,7,8-Tetrachlorodibenzofuran, 1,2,3,7,8-Pentachlorodibenzofuran, 2,3,4,7,8-Pentachlorodibenzofuran, 1,2,3,4,7,8-Hexachlorodibenzofuran, 1,2,3,6,7,8-Hexachlorodibenzofuran, 1,2,3,7,8,9-Hexachlorodibenzofuran, 2,3,4,6,7,8-Hexachlorodibenzofuran, 1,2,3,4,6,7,8-Heptachlorodibenzofuran, 1,2,3,4,7,8,9-Heptachlorodibenzofuran, 1,2,3,4,6,7,8,9-Octachlorodibenzofuran

¹⁰³ PAHs are referred to as Polycyclic Aromatic Compounds (PAC) on the TRI List. This chemical class has 25 compounds in total, 8 of which are nitrogen-containing aromatic compounds. Benz[a]anthracene, chrysene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, fluoranthene, dibenzo[a,i]pyrene, dibenz[a,h]acridine, dibenz[a,j]acridine, dibenzo[a,h]anthracene, dibenzo[a,e]fluoranthene, dibenzo[a,e]pyrene, dibenzo[a,h]pyrene, dibenzo[a,i]pyrene, 7H-dibenzo[c,g]carbazole, 7,12-dimethylbenz[a]anthracene, 1,6-dinitropyrene, 1,8-dinitropyrene, indeno[1,2,3-cd]pyrene, 3-methylcholanthrene, 5-methylchrysene, 6-nitrochrysene, 1-nitropyrene, 4-nitropyrene

¹⁰⁴ <https://www.epa.gov/toxics-release-inventory-tri-program/tri-listed-chemicals>



that it does not include countless smaller facilities that release incidental quantities of dioxins and PAHs that may contribute to background.

Four industrial facilities located in Crosby met TRI reporting criteria for certain chemicals on the TRI List; however, none of the four facilities had TRI reportable releases for dioxin or PAH chemical classes, including Arkema.¹⁰⁵ Only KMCO had TRI reportable releases of naphthalene¹⁰⁶ – a single PAH – in 2018.

Because KMCO had TRI reportable emissions of naphthalene in 2018, Dr. Kaltofen oddly compared benzo[a]pyrene concentrations detected in three samples (BO-4, Q-1, and J-2)¹⁰⁷ collected between KMCO and Arkema to determine which facility was a likely source of benzo[a]pyrene. The logic behind Dr. Kaltofen's newest "apples-to-oranges" analysis is unclear, because KMCO has no TRI reportable releases of PAH (as a chemical class) or of benzo[a]pyrene (only naphthalene).¹⁰⁸ This spatial analysis is also overly simplified in that it ignores many other soil samples in the same vicinity and also ignores all other sources of PAHs besides Arkema and KMCO, including localized sources of PAHs (e.g., Hwy 90, Fig. 10).

Dr. Kaltofen's TRI database search and illogical and limited spatial analysis described above is the sole basis he provides to exclude any impact of other industrial sources, or in fact, any alternative sources, on the proposed Class Area. However, we find:

The logic behind Dr. Kaltofen's cursory PAH spatial evaluation between Arkema and KMCO based on TRI database results is lacking and the whole exercise is irrelevant.

As we described in Section 3 and depicted in Figure 7, the concentrations of PAHs in all 116 soil samples throughout the proposed Class Area bear no spatial relationship to the Arkema facility or to Dr. Auberle's cumulative particulate deposition map.¹⁰⁹ Instead, the three soil samples containing the highest PAH concentrations are randomly located within the proposed Class Area and are found in areas with the lowest modeled particulate deposition rates (Fig. 7A-B). It is therefore most reasonable to attribute the PAHs in these three soil samples to PAH impacts from localized, perhaps property-specific source(s), unrelated to the Arkema events.

In summary, after considering Dr. Kaltofen's irrelevant and illogical assessment of industrial facilities in the Crosby area as potential sources, notably KMCO, we maintain our original (2018) opinion that:

Dr. Kaltofen fails to acknowledge, let alone rule out, the existence and impact of both regional and local alternate source(s) on the proposed Class Area.

¹⁰⁵ For Henkel Corp., the last year reported in the TRI database was 1992. The last year reported for Re-Cal services was in 2013. TRI results are available for Arkema from 1987 to 2017.

¹⁰⁶ In the TRI database, naphthalene is not identified as a member of the polycyclic aromatic compound (PAC) chemical class.

¹⁰⁷ BO-4 and Q-1 are the same cherry-picked samples – one grass and the other a soil – that Dr. Kaltofen repeatedly refers to in his comparisons of benzo[a]pyrene concentrations; see Section 2.2 above.

¹⁰⁸ TRI results are available for KMCO from 1987 to 2018.

¹⁰⁹ We acknowledge they also bear no spatial relationship to the KMCO facility.



Section 6: Summary of Conclusions

Plaintiffs' experts have presented a conceptual site model (CSM) that was perhaps best summarized in Mr. Glass' supplemental report.¹¹⁰ In summary, the CSM put forward by plaintiffs' experts includes the following elements:

- Contaminants – dioxins, PAHs, so-called “custom-SVOCs,” marker metals, and cyanides – were produced during the Arkema events and rapidly spread throughout the proposed Class Area.
- This spreading occurred via the atmospheric transport and deposition of micro- and macroscopic contaminant-laden particles of ash and “black goo.”¹¹¹
- Visual observations of macroscopic ash and “black goo” and dispersion modeling of micro- and macroscopic particles indicate the deposition of contaminant-laden particulates varied within the proposed Class Area but was highest within 1-mile of the Arkema facility, particularly in east-west directions.
- The deposition of these contaminant-laden particulates from the Arkema events increased the concentration of contaminants in the area's soils above “expected” background.
- Contaminant-laden particles deposited shortly after the Arkema events have since persisted, been re-distributed, and continue to expose area residents, although dioxins are the only contaminant present in concentrations of potential concern to human health.

The available chemical data, however, do not support and in fact contradict the plaintiffs' experts' CSM. Using the plaintiffs' dataset, we find:

- (1) Nearly all of the (~120) soil samples collected within the proposed Class Area in the weeks to months following the Arkema events contain contaminants at or below typical background concentrations. Thus, in contrast to the plaintiffs' experts' CSM, the actual data provide no basis to conclude that contaminants were spread and deposited throughout the proposed Class Area.
 - a. Plaintiffs' experts collected only two soil samples outside of the proposed Class Area, which provide no defensible basis to define the region's “expected” background.
 - b. We reached this conclusion in our original 2018 report based upon comparisons to large, published background datasets for dioxins and PAHs in U.S. soils, and have done so (again) herein using “new” smaller published datasets for Texas background soils that Dr. Kaltofen introduced in his supplemental report. Our conclusion remains unchanged.
 - c. The concentrations of total cyanides in soils from the proposed Class Area are typical of background soils based upon the available published datasets known to us.
 - d. There is no new information presented with respect to “custom-SVOCs” or marker metals in Dr. Kaltofen's supplemental report. Furthermore, Ms. Thompson did not consider these to be Constituents of Potential Concern. Therefore, because we had

¹¹⁰ Glass, M. (2021), p. 19.

¹¹¹ Glass, M. (2018), p. 14-15. “Black goo” is a term used by Marc Glass, which he describes as being derived from “*settling of airborne Arkema contaminants and particulates*” that “*coalesced on the soil and gravel surface as a residual, plastic or tar-like material.*”



previously addressed these alleged contaminants in our original (2018) report, they need not be addressed again here.

- e. Only ~3% of the ~120 soil samples from the proposed Class Area contain dioxins or PAHs exceeding typical background benchmarks from the “new” Texas background soil datasets introduced by Dr. Kaltofen.
 - f. If dioxins were co-generated with PAHs during the Arkema events (as posited by the plaintiffs’ CSM) these contaminant-laden particles should have traveled and been deposited together, but the data refute this. With one exception (BX-1; a soil 5.5 miles SW of the Arkema facility), the few soil samples containing an excess of dioxins do not contain an excess of PAHs, demonstrating these two groups of contaminants cannot be from a common source (e.g., ash or “black goo”).
- (2) When the locations of the few (~3%) soil samples containing dioxins or PAHs that exceed typical background concentrations are considered, it is clear that – in contrast to the plaintiffs’ experts’ CSM – they bear no spatial relationship to the Arkema facility or to Dr. Auberle’s particulate deposition maps.
- a. These few soils are found in seemingly random locations and predominantly in locations where Dr. Auberle’s modeled particulate deposition was minimal. Their random distribution relative to the Arkema facility would be consistent with some localized, perhaps property-specific source (such as we described many in our original report, e.g., backyard barrel burning, a notorious source of both dioxins and PAHs).
 - b. Samples containing dioxins or PAHs at or below typical background concentrations (based on the “new” Texas background soil datasets introduced by Dr. Kaltofen) occur throughout the entire proposed Class Area, including within 1 to 2 miles of the Arkema facility or the areas that Dr. Auberle’s modeling indicate should contain orders of magnitude higher contaminants. That is to say, high(er) concentrations of contaminants were not found where the plaintiffs’ experts’ CSM alleges particle deposition was greatest.
 - c. The plaintiffs’ dataset simply provides no data that contaminant-laden particles from the Arkema events were deposited at all, let alone in any excess on properties closer to the Arkema facility.
- (3) The chemical fingerprints of dioxins and PAHs in the alleged Arkema sources, i.e., ash and “black goo”, do not support the plaintiffs’ experts’ CSM.
- a. In the case of dioxins, the distribution of dioxin homologues for the average proposed Class Area soils correlates well with EPA’s published fingerprint for rural and urban soils.
 - b. By contrast, the dioxin homologue patterns for the alleged Arkema sources – ash and “black goo” – are highly variable. Two of the five ash samples contained no detectable dioxin homologues. The remaining two ash and two “black goo” samples had variable distributions of homologues (in many cases non-detects), and in all cases different from the average of the proposed Class Area soils. The “pure” ash and “black goo” contain either no detectable dioxin homologues or exhibit homologue patterns that cannot be reasonably considered as sources of the dioxins measured in the proposed Class Area soils.



- c. In the case of PAHs, the fingerprints of the alleged Arkema sources – ash and “black goo” – are completely different from the fingerprints for the three (of 122) soil samples that contain PAHs in excess of typical background benchmarks (based on the “new” Texas background soil dataset). They also differ from the fingerprints of other selected *ad hoc* solid samples (grass or vacuum cleaner dust) highlighted by Dr. Kaltofen.

In summary, the concentrations, spatial distributions, and chemical fingerprints of contaminants in samples collected from within the proposed Class Area do not support the plaintiffs’ experts’ CSM. Rather, these data are inconsistent with a single point source such as the Arkema events, but they are consistent with contributions from a variety of household, local, and regional sources that, in most cases, reflect typical anthropogenic background conditions.

We had reached this same conclusion in our original 2018 report. Our conclusion is supported by the significant number of alternative potential sources that exist within the Crosby, Texas area.

We reviewed Dr. Kaltofen’s comments on the issue of alternate sources and found:

- (4) Dr. Kaltofen unsuccessfully attempted to rule out only two alternative sources of PAHs and he continues to ignore without explanation other household, local, and regional alternative sources of PAHs and other alleged Arkema-derived chemical we identified in our original report. Of particular note is his ignoring the potential for backyard burning of residential trash and yard waste in burn barrels and burn piles as the largest source of dioxins in the U.S. Specifically,
 - a. Dr. Kaltofen’s blanket claim that oil and gas operations do not contribute PAHs to air emissions is false and inconsistent with published literature.
 - b. Dr. Kaltofen’s illogical assessment of Crosby’s four TRI facilities, in which he rules out KMCO as a source of benzo[a]pyrene, despite the fact it emitted naphthalene in 2018, is irrelevant.

Other opinions we express herein match or parallel opinions we expressed in our original (2018) report. Among the most significant are:

- (5) Dr. Kaltofen continues to cherry-pick data and highlight a few select samples in attempt to support his allegation of widespread impacts from the Arkema events within the proposed Class Area. These often include inappropriate “apples-to-oranges” comparisons between concentrations of totals or individual chemicals reported in various *solid* samples (e.g., grass, ash or “black goo”) and the “new” Texas *soil* background datasets. He repeatedly emphasizes benzo[a]pyrene in two selected samples (Q-1, BO-4) or dioxins in *ad hoc* samples of questionable reliability/relevance (CG-1 “black goo”, CT-1 vacuum cleaner dust or N-1 drywall) – while ignoring the vast majority of the sample data that conflicts with the plaintiffs’ experts’ CSM.
- (6) Plaintiffs’ experts repeatedly refer to the issue of elevated laboratory detection limits, wherein the laboratory reported “non-detection” of any given chemical. Under the guise of being conservative, Dr. Kaltofen, Ms. Thompson, and Mr. Glass assume the laboratory’s elevated detection limit equals the concentration present in the sample. *As a result, samples with no detectable chemicals are sometimes considered to be markedly contaminated (or toxic) based only upon their elevated laboratory detection limits.* The issue of elevated detection limits should have been handled when the data were delivered to plaintiffs’ experts, when there was still the opportunity for the laboratory to re-analyze



the samples. By not having done this, the plaintiffs' experts could be seen to be taking advantage of poor laboratory data.

All of the opinions herein are held to a reasonable degree of scientific certainty.

Respectfully submitted,

Handwritten signature of Scott A. Stout in black ink.

Scott A. Stout, Ph.D., P.G.
NewFields Environmental Forensics Practice, LLC

Handwritten signature of Allen D. Uhler in black ink.

Allen D. Uhler, Ph.D.
NewFields Environmental Forensics Practice, LLC

Handwritten signature of Katherine L. Flanders in blue ink.

Katherine L. Flanders, Ph.D.
NewFields Environmental Forensics Practice, LLC



Appendices

Appendix A Qualifications and Compensation

Appendix B Inventory of plaintiffs' soil and solid samples and their total concentrations of selected chemical groups

SCOTT A. STOUT, Ph.D., P.G.
Senior Geochemist
Environmental Forensics Practice

EXPERIENCE SUMMARY

Dr. Scott Stout is an organic geochemist with 33 years of upstream and downstream petroleum industry and consulting experience. He has extensive knowledge of the chemical compositions of natural/shale gas, crude oil, and coal as well as their products and by-products found in terrestrial and aquatic environments, including stray gas, gasoline, diesel and other fuels, and manufactured gas plant wastes. This knowledge base is supplemented by an understanding of naturally-occurring and anthropogenic “background” contaminants in modern environments, coal carbonization (coal tar production and refining) and combustion processes, oil and gas exploration, production, and refining, fuel handling and storage operations, regulatory history of refined products (e.g., gasoline), surficial geology and sedimentology, and the influences of environmental weathering on the chemical composition of contaminants.



Dr. Stout has written interpretive reports on more than 500 environmental site or spill investigations in the U.S., Canada, Africa, and Australia. He has authored or co-authored over 160 papers published in scientific journals and textbooks. He has co-edited three textbooks (2007, 2016, and 2018) on the environmental forensics aspects of oil spills.

His research has provided a basis for property management decisions and environmental liability allocation through the assessment of the source(s) of contamination in surface water, groundwater, soil, sediments and wildlife for the U.S. Depts. of Justice, Commerce, and Defense and for the oil & gas, utility, pipeline, railroad, wood treatment, maritime shipping, port operations, forest products, and steel industries.

Beginning in May 2010 Dr. Stout led research surrounding the geochemical aspects of NOAA’s NRDA investigation of the BP *Deepwater Horizon* oil spill. In culmination of 5 years of research, in 2015 Dr. Stout co-authored the Trustees’ programmatic Damage Assessment and Restoration Plan (pDARP) and was the lead author of 18 technical reports used in support of the \$8.8 billion NRDA settlement with BP.

Dr. Stout’s knowledge and experience has been utilized in litigious matters involving determination of the specific nature, source(s), age, and extent of contamination. He has provided expert consulting to counsel in more than 70 criminal and civil actions requiring environmental forensics and expert testimony in 25 state, federal, and foreign courts since 2000.

PROFESSIONAL POSITIONS:

Senior Consulting Geochemist, Founding Partner, NewFields Environmental Forensics Practice, LLC, Rockland, MA. 2004-present. Application of geochemical principles in assessment of environmental liability.

Geochemistry Research Leader, Battelle Memorial Institute, Duxbury, MA. 1997-2004. Development and application of geochemical principles in environmental matters. *Environmental Forensics Group Manager*, 2002-2003. *Environmental Forensics Practice Leader*, 2001-2004.

Senior Geochemist, Environmental Technology Group, UNOCAL Corp., Brea, CA, 1995-1997. Geochemical support for company-wide environmental activities.

Geochemist, GeoTechnology Group, UNOCAL Corp., Brea, CA. 1988-1995. Applied research and geochemical support for oil & gas exploration and production activities in California, Alaska, Thailand, and Indonesia.

Teaching Faculty, Southern Illinois University, Department of Geology, Carbondale, IL, 1987-1988. Developed and taught courses in historical geology, coal geology, sedimentology, and organic geochemistry.

Guest Scientist, United States Geological Survey, Reston, VA. Summer 1987.

Research Fellow, FOM Institute of Atomic and Molecular Physics, Amsterdam, The Netherlands, 1986. Conduct basic research on chemistry and structure of macromolecular, plant-derived organic matter in wetlands and Tertiary sediments.

Graduate Research Assistant, The Pennsylvania State University, 1982-1988. Conduct basic research on diagenesis of macromolecular, plant-derived organic matter in wetlands and Tertiary sediments and FeS₂ morphology in processed coals.

EDUCATION

Ph.D., Geology, The Pennsylvania State University, 1988.

M.S., Geology, The Pennsylvania State University, 1985.

Geologic Field School, Virginia Polytechnic Institute and State University, 1982.

B.S., Oceanography, Florida Institute of Technology, 1982.

PROFESSIONAL AFFILIATIONS

American Academy of Forensic Sciences, Engineering Sciences Division (Associate Member, 2000-2002; Full Member 2003-2009)

American Chemical Society, Geochemical or Environmental Divisions (1987-2011)

American Society for Testing and Materials (ASTM), Forensic Environmental Investigations Technical Committee, (2005-2006)

Association for Environmental Health and Sciences, *Environmental Forensics Workshop* Instructor (2000-2002, 2004-2008); *Environmental Background Workshop* Instructor (2009)

Bonn Agreement, Oil Spill Identification Network of Experts (OSINET), Consultant (2007-2009), Member (2007-present)

Contaminated Soil, Sediment and Water, Co-Editor, Environmental Forensics Series, Assoc. Environ. Health & Sci. Publ. (1998-2003)
Environmental Forensics, Co-Editor-in-Chief, (1998-1999); Associate Editor, (1999-2001); Technical Notes Editor, (2002-2004)
 European Association of Organic Geochemists (1992-1994; 2001-present)
 European Committee for Standardization (CEN), *Oil Spill Identification*, Consultant (2003-2006)
 International Society for Polycyclic Aromatic Compounds (2002-2003; 2011-present)
 International Society of Environmental Forensics (2004-present)
 Nordtest, Oil Spill Identification Protocol, Revision Committee (2001-2002)
 Professional Geologist, State of California, No. 6225. (1995-present)
 The Society for Organic Petrology (1986-1992; Managing Counsel, 1990-1992)

PROFESSIONAL PUBLICATIONS

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Expert Testimony on Record (Party Represented)

- 2020 Norfolk Southern Railway Company v Boatright Railroad Products, et al. U.S. District Court, Northern District of Alabama, Southern Division, Case No. 2:17-CV-01787. Client: Keenan Cohen & Merrick, PC, Ardmore, Pennsylvania. Deposition Testimony: Aug. 19, 2020.
- 2019 Daniel Aristabulus Sanda v PTTEP Australasia (Ashmore Cartier) Pty. Ltd. Federal Court of Australia, New South Wales Registry, File Number NSD1245-2016. Client: Allens Linklaters, Melbourne, Victoria, Trial Testimony, Oct. 22, 28, 2019 and Dec. 5-6, 2019.
- 2019 Shannan Wheeler et al. v. Arkema, Inc. U.S. District Court, Southern District of Texas, Houston Div., Case No. 4:17-cv-2960. Client: K&L Gates LLP, Pittsburgh, Pennsylvania. Deposition Testimony: Jan. 17, 2019.
- 2018 People of the State of Illinois v. The Premcor Refining Group, Inc. et al./The Premcor Refining Group, Inc. v. Alenco, Inc. et al. Circuit Court 2, 3rd Judicial Circuit, Madison Co., Illinois. Case No. 03-CH-459. Client: Dowd Bennett, LLP, St. Louis, MO, Deposition Testimony: March 20-21, 2018.
- 2017 Gustave J. LaBarre, Jr., et al. v. Texas Brine Company, LLC et al. U.S. District Court, 23rd Judicial District Court, Parish of Assumption, Louisiana, Docket No. 33796, Division "A". Client: Susman Godfrey, LLP, Houston, TX, Deposition Testimony: Jan. 17, 2017.
- 2016 City of Jacksonville v. Shoppes of Lakeside, Inc. et al. U.S. District Court, Middle District of Florida, Jacksonville Division, C.A. No. 3:12-cv-850-J25-MCR. Client: BakerHostetler, Orlando, FL, Deposition Testimony: July 14, 2016.
- 2015 Plantation Pipe Line Co. v. Lexington Insurance Co. et al. Superior Court, Fulton County, GA. C.A. No. 2012-cv-216835. Client: Butzel Long PC, Washington, D.C., Deposition Testimony: May 8, 2015.
- 2012 ExxonMobil Oil Corporation v. Nicoletti Oil, Inc. et al., U.S. District Court, Eastern District of California, Case No. 1:09-cv-01498-AWI-DLB. Client: Bingham McCutchen LLP, Los Angeles, Deposition Testimony: June 19, 2012, Trial Testimony: March 7, 2013.
- 2011 Plantation Pipe Line Co. v. Aegis Insurance. U.S. District Court, Northern District of Georgia, Case No. 1:09-cv-1260. Client: Butzel Long Tighe Patton, PLLC, Washington, D.C., Deposition Testimony: May 26, 2011.
- 2010 Merco Group at Aventura Landings I, Inc. et al. v Tampa Electric Company. Circuit Court, 11th Judicial Circuit in and for Dade County, Florida, Case No. 04-22909-CA-01. Client: Macfarlane Ferguson & McMullen, Tampa, Florida. Deposition Testimony: September 24, 2010 and April 4, 2011. Trial Testimony: Oct. 13, 2011 and Feb. 9, 2012.
- 2009 Plantation Pipe Line Co. v. Royal Indemnity Co., et al. Superior Court, Fulton County, GA, C.A. No. 2002-CV-54196. Client: Tighe Patton Armstrong Teasdale, PLLC, Washington, D.C. Deposition Testimony: Jan. 22, 2009.
- 2008 Eastern of New Jersey Terminals v. Terminal Ventures, Inc. State of New Jersey, Hudson County Superior Court, C.A. No. L-3012-05. Client: McCusker, Anselmi, Rosen,



- and Carvelli, LLP, representing Terminal Ventures, Inc. Deposition Testimony: Feb. 26, 2008.
- 2007 Larry Bowens, et al. v. 7-Eleven, Inc. et al. State of Indiana, Elkhart County Superior Court, Case No. CV 20D03-0209-CT-48. Client: Kirkland & Ellis, LLP, Chicago, IL, representing 7-Eleven, Inc. Deposition Testimony: Aug. 8-9, 2007.
- 2006 P. Turner et al. v. Murphy Oil Company USA, Inc. et al. U.S. District Court, C.A. No. 05-4144, Section L, Magistrate 2. Client: Frilot, Partridge, Kohnke & Clements, LC, New Orleans, Louisiana. Deposition Testimony: Jan. 5, 2006; Class Certification Hearing Testimony: Jan. 13, 2006.
- 2005 Carson Harbor Village, Ltd. v. Carson Harbor Village Mobil Home Park, et al., Los Angeles Superior Court Case No. BC306759. Client: Weston Benshoof Rochefort Rubalcava & MacCuish LLP, Los Angeles, California, representing Unocal Corporation (cross-complainant). Deposition Testimony: Nov. 18, 2005.
- 2005 Chevron Environmental Management Company et al. v. Indian Refining 1 Limited Partnership, et al., U.S. District Court, Southern District of Illinois, Case No. 02-4162-JPG, Track C. Client: Fox Galvin, LLC, St. Louis, MO. Deposition Testimony: Sept. 15-16, 2005.
- 2005 Sydney Ports Corporation (Filipowski) v. Pontian Shipping Pty. Limited & Kandilis Nikolaos, The Land and Environment Court of New South Wales, Australia, No. 50051 and 50052 of 2004. Client: Dibbs Barker Gosling, Lawyers, Sydney, Australia. Trial Testimony: March 1, 2005.
- 2004 North Dakota Department of Health, et al., Schleicher Land Co., et al., Deb Knudsen, et al., and City of Mandan, Intervenor v. The Burlington Northern and Santa Fe Railway Co., U.S. District Court, CV 04-C-157. Client: Briggs & Morgan, LLP, Minneapolis, MN. Trial Testimony: Sept. 30, 2004.
- 2004 State of Washington v. Tiger Oil Corporation et al. State of Washington, Thurston County Superior Court, Case No. 02-2-00956-2. Client: Naylor, Hales & McCreedy, P.C., Boise, Idaho. Deposition Testimony: April 2, 2004.
- 2003 AT&T Corporation and Alascom, Inc. v. CenturyTel of the Northwest, Inc. U.S. District Court, District of Western Washington at Seattle, CV 01-2151-Z. Client: Davis Wright Tremaine, LLP, Bellevue, WA. Deposition Testimony: July 11, 2003.
- 2003 Fairey et al. v. The Exxon Company, U.S.A., The Exxon Corporation, Standard Oil Co. State of South Carolina, County of Hampton/Orangeburg, CV 92-CP-25-230/CV 94-CP-38-118. Client: Archer & Greiner, P.C., Haddenfield, NJ. Deposition Testimony: March 22, 2003.
- 2002 Norfolk Southern Corporation et al. v. Chevron U.S.A., Inc. and Shell Oil Co. U.S. District Court, Middle District of Florida, Jacksonville Div., Civil Action No. 3:00-CV-366-J-21A. Client: Smith Hulsey & Busey, Jacksonville, FL. Deposition Testimony: Sept. 24, 2002.
- 2002 State of New Mexico v. General Electric et al. including Chevron Pipeline Co., Texaco, Inc., and Texaco Refining and Marketing, Inc. U.S. District Court, District of New Mexico, CV 99-1254 BSJ and CV 99-1118 BSJ. Client: Campbell, George, & Strong, LLP, Houston TX. Deposition Testimony.



- 2001 Chandler et al. v. Chevron U.S.A., Inc. et al. Circuit Court, Hale County, Alabama, Case No. CV-98-122. Client: Balch & Bingham, Birmingham, AL representing ST Services. Client was not actually party to lawsuit but their property abuts Defendants' properties. Deposition Testimony: March 21, 2001.
- 2000 BP Exploration & Oil Company v. Maintenance Services, Inc. et al., U.S. District Court of Northern Ohio, Case No. 5:99-CV-2638; Client: Brouse McDowell, Akron, OH. Deposition: Dec. 8, 2000 and Trial Testimony.
- 2000 American Automobile Insurance Company et al. v. J.P. Noonan Transportation Inc., Middlesex County Superior Court, Massachusetts, CV-97-325D. Client: Monahan & Associates, Boston, MA. Deposition Testimony.



Allen D. Uhler, Ph.D.
Senior Chemist/Consultant

EXPERIENCE SUMMARY

Dr. Allen Uhler has over 30 years of experience in the field of environmental chemistry, with a specialization in environmental forensics—the integration of advanced chemical analyses, chemical fate and behavior, source identification techniques, and operational practices—to determine the nature, sources, and fate of industrial and man-made chemicals in the environment. Dr. Uhler has worked on hundreds of projects focused on understanding the occurrence, physical behavior, sources, and fate of anthropogenic contaminants including PAHs, PCBs, chlorinated pesticides, chlorinated dioxins and furans, organometallic compounds, trace metals and specialized industrial chemicals in waters, soils, sediments, and soil- and air-borne vapors. Dr. Uhler has consulted extensively on technical allocation approaches for PRP group and remedial action decision makers. He has published or presented more than 150 treatises on the analysis, occurrence, distribution, and fate of persistent anthropogenic industrial chemicals in the environment. Dr. Uhler is the founding co-editor of the journal *Environmental Forensics*, and currently serves as a member of its editorial board.

As a highly experienced analytical chemist, Al Uhler is familiar with the operations, practices, and reporting standards of environmental chemistry laboratories. As a former laboratory director, he is knowledgeable about data quality requirements, data fitness, and data usability as it pertains to the suitability, benefits, and limitations of chemical characterization data used in environmental, ecological risk and human health investigations.

Prior to joining NewFields Dr. Uhler was a senior consulting chemist at Battelle Memorial Institute for over 17 years.

EDUCATION AND TRAINING

Ph.D. Chemistry, University of Maryland – 1983
M.S. Chemistry, University of Maryland – 1981
B.A. Chemistry, SUNY, Plattsburgh – 1978

EMPLOYMENT HISTORY

University of Maryland Center for Estuarine and Environmental Studies (1983-1985)
United States Food and Drug Administration (1983-1987)
Battelle Memorial Institute (1987-2004)
NewFields Environmental Forensics Practice, LLC (2004 to Present)



APPOINTMENTS AND PROFESSIONAL AFFILIATIONS

- Interstate Technology Regulatory Council (ITRC) Co-author and committee member, Guidance on Use of Soil Background Concentrations in Risk Assessment. 2020 – Present.
- Editorial Board, *Journal of Environmental Forensics*. Amherst Press. 1999 – Present.
- Founding Co-Editor-in-Chief, *International Journal of Environmental Forensics*. Amherst Press. 1998-1999.
- Editorial Advisory Board, *Soil, Sediment, Groundwater*. 1997 – 2004.
- Technical Advisory Committee, *Association for Environmental Health and Sciences*, 1996 – 2005.
- Staff Fellow, US Food and Drug Administration, Division of Environmental and Elemental Contaminants Branch, Methods Development Group, Washington, DC. 1985 – 1987.
- Associate Referee, Association of Official Analytical Chemists, (AOAC) 1985 – 1995.
- Faculty Research Associate, University of Maryland, 1983 – 1985.

PUBLICATIONS

- [1] Uhler, A.D., Hardenstine, J.H., Edwards, D.A., and Lotufo, G.R. (2021). Leaching rate of polychlorinated biphenyls (PCBs) from marine paint chips. *Arch. Environ. Con. Tox.* DOI :10.1007/s00244-021-00868-6.
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- [3] Douglas, G.S., Stout, S.A., Uhler, A.D., McCarthy, K.J., and Emsbo-Mattingly, S.D. (2016). Advantages of quantitative chemical fingerprinting in oil spill identification and allocation of mixed hydrocarbon contaminants. In: *Standard Handbook of Oil Spill Environmental Forensics: Fingerprinting and Source Identification*, 2nd Ed., S.A. Stout and Z. Wang, Eds., Elsevier Publishing Co., Boston, MA, p. 789-847.
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Katherine L. Flanders, Ph.D.
Chemist/Consultant
Environmental Forensics Practice

EXPERIENCE SUMMARY

Dr. Flanders is a chemist specializing in the characterization of sources and fate of contaminants in the environment. Dr. Flanders utilizes her knowledge of advanced analytical chemistry and strong background in fundamental physical chemistry to elucidate the behavior and transformation of chemicals in air, water, soil, and sediments. Dr. Flanders often applies geospatial and statistical tools in assessments at complex sites.

Many projects require an understanding of industry-specific, process chemistry to evaluate potential nexus between historic and/or current operations and contaminants of potential concern. Dr. Flanders has experience in the reconstruction of chemical processes for a variety of industrial operations that include refineries, various petrochemical plants, dye manufacturing and former manufactured gas plants.

Prior to joining NewFields, Ms. Flanders completed her dissertation research in the fields of atmospheric chemistry and organic geochemistry. Her work focused on the transformation of organic molecules in air and sediments. While at the University of Massachusetts, Dr. Flanders also managed contracts for the University's Environmental Analytical Facility. Through both her dissertation research and industry contracts, Katherine gained expertise using a variety of state-of-the-art analytical techniques that are pivotal to modern environmental science investigations. Such techniques include Isotope Ratio Mass Spectrometry (IRMS), Inductively Coupled Plasma Mass Spectrometry (ICPMS), Gas Chromatography Mass Spectrometry (GCMS), Scanning Electron Microscopy Energy Dispersive Spectroscopy (SEM/EDS), and Fourier Transform Infrared Spectroscopy (FTIR).

EDUCATION AND TRAINING

Ph.D. Chemistry/ Green Chemistry Track, University of Massachusetts - 2017
B.S. Chemistry, University of Maryland - 2008

EMPLOYMENT HISTORY

University of Massachusetts (2008 - 2015)
Battelle Memorial Institute (2009)
NewFields Environmental Forensics Practice LLC (2011-Present)

PROFESSIONAL AFFILIATIONS

American Chemical Society (ACS)
Association for the Sciences of Limnology and Oceanography (ASLO)

PUBLICATIONS AND PRESENTATIONS

- [1] Howard, M., Ruffing, A., DaCosta, M, Krieger, G., Howard, H., Smallwood, C., Timlin, J., Finke, A, Maes, D., Emsbo-Mattingly, S, and Flanders, K. (2019). Detecting Source Emissions Using Bioindicators. Atlanta, Georgia. May 2, 2019.



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- [3] Flanders, K.L. (2017). Assessing Anthropogenic Influences on the Environment: From Atmospheric to Lacustrine Systems (Doctoral Dissertation). University of Massachusetts Boston. ProQuest Number 10280301.
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Professional Education Instructor

- [1] “Environmental Forensics Workshop” Douglas, G.S., Litman, E., Flanders, K. 2017. University of Massachusetts, Amherst, MA. 33rd Annual International Conference on Soils, Sediments, Water and Energy, University of Massachusetts, Amherst, MA. October 17, 2017.
- [2] “Environmental Forensics Workshop” Emsbo-Mattingly, S.D., Litman, E., Flanders, K. 2015. University of Massachusetts, Amherst, MA. 31st Annual International Conference on Soils, Sediments, Water and Energy, University of Massachusetts, Amherst, MA. October 20, 2015.
- [3] “Environmental Forensics Workshop” Emsbo-Mattingly, S.D., Litman, E., Flanders, K. 2014. University of Massachusetts, Amherst, MA. 30th Annual International Conference on Soils, Sediments, Water and Energy, University of Massachusetts, Amherst, MA. October 21, 2014.

NewFields Compensation

NewFields is compensated for the work in this matter at rates of \$325/hour for Drs. Stout and Uhler and \$275/hour for Dr. Flanders for both consulting and testimony.

Sample ID	Location	Matrix	Sample Date	X_Coord (2021)	Y_Coord (2021)	Distance To Plant (mi)	Total Dioxin TEQ (ppt; nd=DL)*	Total PAHs (n=16; ppb)	Total Custom- SVOC (n=6; ppb)	Total Cyanides (ppm)	Total "Marker" Metals (n=4; ppm)
CQ-1	onsite	Soil	7/11/2018	-95.022903	29.950300	0.11	4.76	136	40.1	na	na
CR-1	onsite	Soil	7/11/2018	-95.021698	29.949600	0.05	1.27	64.0	88.6	na	na
CS-1	onsite	Soil	7/11/2018	-95.020302	29.947901	0.12	9.39	229	3581	na	na
CS-2	onsite	Soil	7/11/2018	-95.020302	29.947901	0.12	8.16	72.7	301	na	na
CS-2 DUP	onsite	Soil	7/11/2018	-95.020302	29.947901	0.12	na	na	na	na	na
DD-4	onsite	Soil	7/11/2018	-95.020302	29.947800	0.13	18.2	1378	6494	na	na
A-1	offsite	Soil	9/4/2017	-95.025703	29.958799	0.72	na	nd	na	0.15	16033
AC-1	offsite	Soil	9/19/2017	-95.018300	29.940500	0.47	2.39	39.9	na	0.11	14688
AC-2	offsite	Soil	9/19/2017	-95.019302	29.941099	0.57	2.17	40.0	na	0.2	19694
AC-3	offsite	Soil	9/19/2017	-95.020203	29.941000	0.56	1.78	4.80	na	0.1	16888
AC-4	offsite	Soil	9/19/2017	-95.021004	29.940901	0.56	2.36	131	na	0.17	16475
AC-5	offsite	Soil	9/19/2017	-95.021896	29.940001	0.62	2.19	20.8	na	0.096	12135
AC-6	offsite	Soil	9/19/2017	-95.021599	29.940800	0.56	2.43	136	na	0.11	14913
AC-7	offsite	Soil	9/19/2017	-95.021797	29.939301	0.66	1.70	157	na	nd	21978
AC-8	offsite	Soil	9/19/2017	-95.021004	29.939301	0.67	16.2	238	na	0.067	16363
AC-9	offsite	Soil	9/19/2017	-95.019798	29.939600	0.66	1.41	nd	na	0.36	14792
AC-10	offsite	Soil	9/19/2017	-95.018204	29.939800	0.67	1.68	nd	na	0.17	20013
AC-14	offsite	Soil	9/19/2017	-95.020798	29.939800	0.63	1.71	nd	na	0.11	7742
AC-15	offsite	Soil	9/19/2017	-95.018898	29.940001	0.64	1.99	28.2	na	0.15	18825
AG-1	offsite	Soil	9/20/2017	-95.076200	29.937200	3.35	15.6	98.3	na	0.37	10007
AI-1	offsite	Soil	9/20/2017	-95.016900	29.921500	1.92	1.73	na	na	na	na
AI-3	offsite	Soil	9/20/2017	-95.016900	29.921500	1.92	1.55	30.7	na	0.11	33035
AJ-1	offsite	Soil	9/20/2017	-95.064800	29.874000	5.78	1.15	nd	na	nd	12659
AK-1	offsite	Soil	9/20/2017	-95.049301	29.868099	3.76	1.11	nd	na	0.24	12598
AK-2	offsite	Soil	9/20/2017	-95.049301	29.868099	3.76	0.491	nd	na	0.12	7447
AL-1	offsite	Soil	9/20/2017	-95.049400	29.867399	3.80	1.15	110	na	nd	5896
AM-1	offsite	Soil	9/20/2017	-95.014900	29.962400	1.07	1.09	nd	na	0.17	5888
AN-2	offsite	Soil	9/22/2017	-95.018997	29.955500	0.50	1.06	nd	na	0.097	14442
AO-1	offsite	Soil	9/22/2017	-95.021401	29.956600	0.55	3.40	nd	na	na	na
AO-2	offsite	Soil	9/22/2017	-95.021401	29.956600	0.55	3.14	nd	na	0.22	8753
AR-1	offsite	Soil	9/22/2017	-95.014801	29.961399	0.70	1.06	na	na	na	na
AT-2	offsite	Soil	9/23/2017	-95.030998	29.948200	1.30	4.33	28.5	na	0.12	5204
AV-1	offsite	Soil	9/23/2017	-94.997902	29.930300	2.00	78.4	37.5	na	0.18	15257
AW-2	offsite	Soil	9/23/2017	-94.998200	29.949200	1.42	32.8	9.80	na	0.3	7894
AX-1	offsite	Soil	9/23/2017	-94.951103	29.983601	4.90	0.405	nd	na	0.21	17923
AY-2	offsite	Soil	9/25/2017	-95.029999	29.902201	3.20	2.77	12.9	na	na	14815
AZ-2	offsite	Soil	9/26/2017	-95.022202	29.966299	1.22	6.19	47.4	na	0.2	18549
AZ-3	offsite	Soil	9/26/2017	-95.022202	29.966299	1.22	10.9	48.0	na	1.1	18047

Sample ID	Location	Matrix	Sample Date	X_Coord (2021)	Y_Coord (2021)	Distance To Plant (mi)	Total Dioxin TEQ (ppt; nd=DL)*	Total PAHs (n=16; ppb)	Total Custom- SVOC (n=6; ppb)	Total Cyanides (ppm)	Total "Marker" Metals (n=4; ppm)
B-2	offsite	Soil	9/4/2017	-95.074402	29.952601	3.18	na	139	na	0.14	4831
B-3	offsite	Soil	9/4/2017	-95.074402	29.952601	3.18	na	nd	na	0.23	4831
B-4	offsite	Soil	9/4/2017	-95.074402	29.952601	3.18	na	nd	na	0.11	3676
BA-1	offsite	Soil	9/26/2017	-95.014000	29.936899	0.70	1.21	4.10	na	na	19787
BA-2	offsite	Soil	9/26/2017	-95.014000	29.936899	0.70	0.861	34.4	na	na	23590
BA-3	offsite	Soil	9/26/2017	-95.014000	29.936899	0.70	1.13	nd	na	na	25626
BA-4	offsite	Soil	9/26/2017	-95.014000	29.936899	0.70	0.973	nd	na	na	23876
BA-5	offsite	Soil	9/26/2017	-95.014000	29.936899	0.70	0.974	nd	na	na	24241
BA-6	offsite	Soil	9/26/2017	-95.014000	29.936899	0.70	0.890	nd	na	na	12343
BB-2	offsite	Soil	9/26/2017	-95.013199	29.938601	0.90	0.753	nd	na	na	28674
BC-2	offsite	Soil	9/26/2017	-95.024498	29.959400	0.76	8.67	nd	na	na	14755
BD-1	offsite	Soil	9/27/2017	-95.060402	29.869600	5.85	37.9	nd	na	na	14761
BD-2	offsite	Soil	9/27/2017	-95.060402	29.869600	5.85	1.14	nd	na	na	12592
BE-10	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	0.712	nd	na	na	22938
BE-11	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	0.741	62.5	na	na	17332
BE-2	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	1.00	nd	na	na	17246
BE-3	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	0.865	nd	na	na	11454
BE-4	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	0.843	nd	na	na	13323
BE-5	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	0.393	5.30	na	na	15429
BE-6	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	0.595	12.4	na	na	16142
BE-7	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	0.520	nd	na	na	15416
BE-8	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	0.574	nd	na	na	18587
BE-9	offsite	Soil	9/25/2017	-95.007797	29.961201	0.90	0.604	nd	na	na	18225
BF-2	offsite	Soil	9/25/2017	-95.027000	29.958000	0.75	0.514	nd	na	nd	21411
BF-3	offsite	Soil	9/25/2017	-95.027000	29.958000	0.75	1.20	nd	na	0.24	18436
BG-1	offsite	Soil	9/27/2017	-95.008202	29.902500	3.35	0.548	nd	na	na	24776
BG-2	offsite	Soil	9/27/2017	-95.008202	29.902500	3.35	8.06	2085	na	na	18426
BH-5	offsite	Soil	9/25/2017	-95.015602	29.961399	0.95	0.414	5.30	na	na	15429
BL-2	offsite	Soil	10/3/2017	-95.038498	29.931601	1.52	1.52	34.0	na	na	8993
BM-1	offsite	Soil	10/3/2017	-95.006401	29.960199	1.27	1.74	nd	na	na	13655
BM-3	offsite	Soil	10/3/2017	-95.006401	29.960199	1.27	20.5	166	na	na	5824
BN-2	offsite	Soil	10/3/2017	-95.009804	29.924200	1.90	3.55	124	na	na	42448
BO-2	offsite	Soil	10/3/2017	-95.018997	29.941999	0.56	0.746	nd	na	na	10074
BO-3	offsite	Soil	10/3/2017	-95.018997	29.941999	0.56	2.75	20.5	na	na	17201
BO-6	offsite	Soil	10/3/2017	-95.018997	29.941999	0.56	0.33	nd	na	na	10849
BP-2	offsite	Soil	10/4/2017	-95.015701	29.971201	1.60	0.997	nd	na	na	11169
BQ-2	offsite	Soil	10/4/2017	-95.010696	29.972000	1.74	2.15	nd	na	na	28462
BR-2	offsite	Soil	10/4/2017	-95.007301	29.972300	1.85	1.36	nd	na	na	22593

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BS-2	offsite	Soil	10/4/2017	-95.008499	29.970699	1.72	3.23	184	na	na	50247
BT-2	offsite	Soil	10/4/2017	-95.009102	29.959299	1.09	9.39	nd	na	na	13417
BU-3	offsite	Soil	10/4/2017	-95.016502	29.958300	0.77	1.92	nd	na	na	8935
BW-3	offsite	Soil	10/4/2017	-95.053597	29.959000	1.91	0.608	nd	na	na	10160
BW-4	offsite	Soil	10/4/2017	-95.053597	29.959000	1.91	0.897	nd	na	na	9449
BX-1	offsite	Soil	10/5/2017	-95.050499	29.872500	5.52	71.0	8108	na	na	8544
BY-3	offsite	Soil	10/5/2017	-95.009499	29.970100	1.66	1.18	nd	na	na	21691
BY-5	offsite	Soil	10/5/2017	-95.009499	29.970100	1.66	0.853	187	na	0.11	16702
BZ-1	offsite	Soil	10/5/2017	-95.068398	29.867300	6.26	14.8	nd	na	na	18075
CA-1	offsite	Soil	10/5/2017	-95.071701	29.866699	6.39	1.93	nd	na	na	7571
CB-1	offsite	Soil	10/5/2017	-95.060402	29.879700	5.27	3.11	nd	na	na	13933
CC-3	offsite	Soil	10/10/2017	-95.048798	29.984699	2.95	0.262	nd	na	na	2734
CC-4	offsite	Soil	10/10/2017	-95.048798	29.984699	2.95	0.593	58.5	na	na	8640
CC-5	offsite	Soil	10/10/2017	-95.048798	29.984699	2.95	0.674	nd	na	na	5052
CC-6	offsite	Soil	10/10/2017	-95.048798	29.984699	2.95	0.326	117	na	na	7733
CF-1	offsite	Soil	7/10/2018	-95.001999	29.958901	1.38	0.238	14.7	384	na	na
CG-2	offsite	Soil	7/10/2018	-95.021004	29.943701	0.36	1.10	50.2	163	na	na
CG-4	offsite	Soil	7/10/2018	-95.021004	29.943701	0.36	0.599	19.3	106	na	na
CH-1	offsite	Soil	7/10/2018	-95.118897	29.982700	6.25	1.28	29.4	240	na	na
CI-1	offsite	Soil	7/10/2018	-94.945702	29.982800	5.13	2.77	72.7	159	na	na
CJ-1	offsite	Soil	7/10/2018	-94.987900	29.870400	5.80	2.00	42.5	117	na	na
CL-1	offsite	Soil	7/10/2018	-95.021004	29.940901	0.56	0.27	41.3	135	na	na
CL-2	offsite	Soil	7/10/2018	-95.021797	29.939301	0.66	0.673	28.2	80.8	na	na
CL-3	offsite	Soil	7/10/2018	-95.021004	29.939301	0.67	0.864	80.0	94.9	na	na
CL-4	offsite	Soil	7/10/2018	-95.021004	29.940901	0.56	0.97	19.2	69.0	na	na
CN-1	offsite	Soil	7/11/2018	-95.023697	29.946301	0.21	4.14	38.7	74.3	na	na
CN-1 Duplicate	offsite	Soil	7/11/2018	-95.023697	29.946301	0.21	na	36.1	64.7	na	na
CO-1	offsite	Soil	7/11/2018	-95.023003	29.946501	0.17	2.96	36.5	179	na	na
CO-1 Duplicate	offsite	Soil	7/11/2018	-95.023003	29.946501	0.17	3.24	na	na	na	na
CP-1	offsite	Soil	7/11/2018	-95.023201	29.944500	0.31	3.57	156	98.4	na	na
CU-1	offsite	Soil	7/11/2018	-95.032700	29.941401	0.82	0.647	157	303	na	na
CU-2	offsite	Soil	7/11/2018	-95.031899	29.938400	0.94	1.09	29.0	44.9	na	na
CU-2 DUP	offsite	Soil	7/11/2018	-95.031899	29.938400	0.94	na	na	na	na	na
CV-2	offsite	Soil	7/11/2018	-95.021572	29.933083	1.09	na	72.9	253	na	na
CW-1	offsite	Soil	7/10/2018	na	na	na	3.43	49.8	214	na	na
G-10	offsite	Soil	9/20/2017	-95.062698	29.964500	2.65	2.09	na	na	na	na
G-11	offsite	Soil	9/20/2017	-95.062698	29.964500	2.65	1.55	na	na	na	na
G-12	offsite	Soil	9/20/2017	-95.062698	29.964500	2.65	1.70	na	na	na	na

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G-13	offsite	Soil	9/20/2017	-95.062698	29.964500	2.65	2.17	na	na	na	na
G-2	offsite	Soil	9/5/2017	-95.062698	29.964500	2.65	21.1	23.1	na	na	14478
G-5	offsite	Soil	9/20/2017	-95.062698	29.964500	2.65	1.70	na	na	na	na
G-6	offsite	Soil	9/20/2017	-95.062698	29.964500	2.65	1.28	na	na	na	na
G-7	offsite	Soil	9/20/2017	-95.062698	29.964500	2.65	3.30	na	na	na	na
G-8	offsite	Soil	9/20/2017	-95.062698	29.964500	2.65	2.74	na	na	na	na
G-9	offsite	Soil	9/20/2017	-95.062698	29.964500	2.65	1.78	na	na	na	na
J-2	offsite	Soil	9/7/2017	-95.041496	29.930000	1.50	4.60	1007	449	0.21	91118
K-3	offsite	Soil	9/7/2017	-95.045799	29.925100	2.21	0.861	nd	na	nd	10592
L-1	offsite	Soil	9/7/2017	-95.045601	29.925200	2.16	2.09	nd	na	0.16	12732
L-2	offsite	Soil	9/7/2017	-95.045601	29.925200	2.16	3.18	80.7	na	0.066	5286
M-1	offsite	Soil	9/9/2017	-95.021401	29.932699	1.10	0.652	nd	na	0.17	13871
M-2	offsite	Soil	9/9/2017	-95.021401	29.932699	1.10	1.98	353	na	0.13	16495
P-3	offsite	Soil	9/11/2017	-95.018303	29.970900	1.55	1.08	3230	2230	0.24	15302
Q-1	offsite	Soil	9/11/2017	-95.019203	29.941700	0.50	9.23	2300	9234	0.18	20631
Q-2	offsite	Soil	9/11/2017	-95.019203	29.941700	0.50	0.900	nd	866	0.55	19414
S-2	offsite	Soil	9/11/2017	-95.013496	29.903700	3.16	4.90	131	na	0.21	15951
T-2	offsite	Soil	9/14/2017	-95.049202	29.949499	1.60	0.617	69.9	na	nd	16660
T-3	offsite	Soil	9/14/2017	-95.049202	29.949499	1.60	1.32	24.4	na	1	5772
U-2	offsite	Soil	9/11/2017	-95.013298	29.905001	3.08	1.02	nd	na	0.16	52207
X-2	offsite	Soil	9/12/2017	-95.074501	29.952700	3.13	2.70	46.1	na	0.31	3652
AF-1	BKGRD	Soil	9/20/2017	-95.207800	29.978200	11.13	4.85	163	na	0.4	15815
CK-1	BKGRD	Soil	7/10/2018	-94.889801	30.053400	10.71	0.216	87.4	95.4	na	67.1
CM-1	onsite	Solid	7/11/2018	-95.021599	29.945700	0.22	6.33	643	3455	na	na
CM-1 Duplicate	onsite	Solid	7/11/2018	-95.021599	29.945700	0.22	2.75	na	na	na	na
DA-1	onsite	Solid/Tape Dust	7/11/2018	-95.021797	29.948099	0.06	na	13220	12729	na	na
DA1 Duplicate	onsite	Solid/Tape Dust	7/11/2018	-95.021797	29.948099	0.06	na	10172	8026	na	na
DD-3	onsite	Ash/Soil	7/11/2018	-95.020302	29.947800	0.13	na	295	588	na	na
B-1	offsite	Ash	9/4/2017	-95.074402	29.952601	3.18	na	22.8	na	4.1	4272
BZ-2	offsite	Ash	na	-95.068378	29.867308	6.26	na	na	na	na	na
CE-1	offsite	Ash	11/14/2017	-95.046069	29.947614	1.51	2.28	na	na	na	na
E-1	offsite	Ash	9/5/2017	-95.063301	29.952200	2.48	22.3	567	na	8.6	2090
F-1	offsite	Ash	9/5/2017	-95.048401	29.950100	1.58	4.30	909	na	13.3	na
M-8	offsite	Ash	na	-95.021436	29.932678	1.10	na	na	na	na	na
N-2	offsite	Ash	na	-95.021572	29.933083	1.09	na	na	na	na	na
S-1	offsite	Ash	na	-95.013456	29.903736	3.16	na	na	na	na	na
T-1	offsite	Ash	9/10/2017	-95.049202	29.949499	1.60	2.11	na	23865	na	na
T-1Duplicate	offsite	Ash	9/10/2017	-95.049202	29.949499	1.60	na	na	24220	na	na

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T-4	offsite	Ash	na	-95.049158	29.949514	1.60	na	na	na	na	na
U-1	offsite	Ash	9/11/2017	-95.013298	29.905001	3.08	25.3	na	na	na	na
BY-4	offsite	Solid/?	10/5/2017	-95.009499	29.970100	1.66	1.38	nd	na	na	1533
CG-3	offsite	Solid/?	7/10/2018	-95.021004	29.943701	0.36	0.984	87.1	253	na	na
H-1	offsite	Solid/?	9/6/2017	-95.014999	29.962999	1.03	63.2	nd	na	na	na
H-2	offsite	Solid/?	9/6/2017	-95.014999	29.962999	1.03	18.8	nd	na	na	na
J-1	offsite	Solid/?	9/7/2017	-95.041496	29.930000	1.50	19.4	na	na	na	na
CG-1	offsite	Solid/black goo	7/10/2018	-95.021004	29.943701	0.36	95.9	982	26874	na	na
AN-4	offsite	Solid/Dry Wall	9/22/2017	-95.018997	29.955500	0.50	1.11	na	na	na	na
AO-4	offsite	Solid/Dry Wall	9/22/2017	-95.021401	29.956600	0.55	4.95	na	na	na	na
N-1	offsite	Solid/Dry Wall	9/9/2017	-95.021599	29.933100	1.09	653	nd	826	nd	173179
AP-2	offsite	Solid/Filter	9/22/2017	-95.015600	29.958800	0.82	22.8	na	na	na	na
AP-3	offsite	Solid/Filter	9/22/2017	-95.015600	29.958800	0.82	3.92	na	na	na	na
AB-1	offsite	Solid/Grass	9/14/2017	-95.022903	29.943100	0.40	3.05	nd	na	0.88	9660
BA-7	offsite	Solid/Grass	9/26/2017	-95.014000	29.936899	0.70	2.65	37.9	na	0.065	1877
BA-8	offsite	Solid/Grass	9/26/2017	-95.014000	29.936899	0.70	1.05	152	na	nd	1035
BF-4	offsite	Solid/Grass	9/25/2017	-95.027000	29.958000	0.75	2.39	nd	na	nd	3273
BN-3	offsite	Solid/Grass	10/3/2017	-95.009804	29.924200	1.90	1.51	nd	na	na	2686
BO-4	offsite	Solid/Grass	10/3/2017	-95.018997	29.941999	0.56	na	2072	na	na	na
BU-2	offsite	Solid/Grass	10/4/2017	-95.016502	29.958300	0.77	3.20	nd	na	na	2288
AC-11	offsite	Solid/Hay	9/19/2017	-95.018300	29.940500	0.47	2.16	nd	na	nd	2222
AC-12	offsite	Solid/Hay	9/19/2017	-95.018300	29.940500	0.47	2.28	nd	na	nd	2779
AC-13	offsite	Solid/Hay	9/19/2017	-95.018300	29.940500	0.47	3.22	nd	na	nd	3021
BG-4	offsite	Solid/Hay	11/14/2017	-95.008156	29.902525	3.35	na	na	na	na	na
J-3	offsite	Solid/Paper	9/7/2017	-95.041496	29.930000	1.50	3.91	nd	na	na	na
CF-2	offsite	Solid/Plant	7/10/2018	-95.001999	29.958901	1.38	2.92	2.08	176	na	na
CL-5	offsite	Solid/Plant	7/10/2018	-95.018303	29.940500	0.62	8.23	13.9	704	na	na
CL-6	offsite	Solid/Plant	7/10/2018	-95.018303	29.940500	0.62	0.935	8.13	35.2	na	na
CL-7	offsite	Solid/Plant	7/10/2018	-95.018303	29.940500	0.62	5.52	130	375	na	na
CN-2	offsite	Solid/Plant	7/11/2018	-95.023697	29.946301	0.21	2.86	95.6	252	na	na
CN-2 Duplicate	offsite	Solid/Plant	7/11/2018	-95.023697	29.946301	0.21	2.36	96.2	448	na	na
CV-3	offsite	Solid/Plant	7/11/2018	-95.021572	29.933083	1.09	1.39	5.78	442	na	na
CW-2	offsite	Solid/Plant	7/10/2018	na	na	na	1.91	56.9	152	na	na
CT-1	offsite	Solid/Vacuum Dus	7/11/2018	-95.021572	29.933083	1.09	117	611	5998	na	na
AN-1	offsite	Solid/wipe	9/22/2017	-95.018997	29.955500	0.50	17.9	nd	na	na	15.3
AQ-1	offsite	Solid/wipe	9/22/2017	-95.019501	29.958201	0.70	15.3	nd	na	na	1.05
H-3	offsite	Solid/wipe	9/6/2017	-95.014999	29.962999	1.03	10.3	nd	na	na	na
H-4	offsite	Solid/wipe	9/6/2017	-95.014999	29.962999	1.03	9.88	na	na	na	0.12

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H-5	offsite	Solid/wipe	9/6/2017	-95.014999	29.962999	1.03	9.88	na	na	na	na
H-6	offsite	Solid/wipe	9/6/2017	-95.014999	29.962999	1.03	11.2	nd	na	na	na
J-5	offsite	Solid/wipe	9/7/2017	-95.041496	29.930000	1.50	na	na	na	na	0.41
J-6	offsite	Solid/wipe	9/7/2017	-95.041496	29.930000	1.50	6.53	nd	na	na	113
K-2	offsite	Solid/wipe	9/7/2017	-95.045799	29.925100	2.21	6.31	nd	na	na	32.2
L-3	offsite	Solid/wipe	9/7/2017	-95.045601	29.925200	2.16	13.8	nd	na	na	4.49
L-4	offsite	Solid/wipe	9/7/2017	-95.045601	29.925200	2.16	5.14	nd	na	na	6.70
M-5	offsite	Solid/wipe	9/9/2017	-95.021401	29.932699	1.10	5.97	nd	na	na	2.10
M-6	offsite	Solid/wipe	9/9/2017	-95.021401	29.932699	1.10	6.07	nd	na	na	2.12
M-7	offsite	Solid/wipe	9/9/2017	-95.021401	29.932699	1.10	3.38	nd	na	na	0.39
X-3	offsite	Solid/wipe	9/14/2017	-95.074501	29.952700	3.13	3.06	nd	na	nd	2953
X-4	offsite	Solid/wipe	9/14/2017	-95.074501	29.952700	3.13	5.65	nd	na	na	5.78
Z-1	offsite	Solid/wipe	9/12/2017	-95.010696	29.962099	1.16	3.61	nd	na	na	3.36

*TEQ calculated using 2005 TEFs; verified by NewFields

na - not available, not measured

nd - not detected



Original data from Glass, Thompson, and Kaltofen 2021 reports/files



Original data from Kaltofen 2021 files only



Original data from Thompson 2021 report



Original data from various 2018 plaintiffs' files